L. A. Freese

RECORD OF DECISION

Stauffer Plant Site

Site. No. 932053

Prepared by:

New York State
Department of Environmental Conservation

July 1992

SMC-789 0862

DECLARATION STATEMENT - RECORD OF DECISION

Site Name & Location:

Stauffer Plant Site
Site Registry Number: 932053
Town of Lewiston, Niagara County, NY
Classification Code: 2

Statement of Purpose:

This Record of Decision (ROD) sets forth the selected Remedial Action Plan (RAP) for the Stauffer Plant Site. This remedial action plan was developed in accordance with the Comprehensive Environment Response, Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and the New York State Environmental Conservation Law (ECL). The selected remedial plan complies to the maximum extent practicable with Standards, Criteria and Guidelines (SCGs) of the Federal and State environmental statutes and will be protective of human health and the environment.

Statement of Basis:

This decision is based upon the Administrative Record for the Stauffer Plant Site and upon public input to the Proposed Remedial Action Plan (PRAP). A copy of the Administrative Record is available at the New York State Department of Environmental Conservation, 270 Michigan Avenue, Buffalo, New York and copies of the Feasibility Study and the PRAP are available at the Lewiston Public Library, 305 South Eighth Street, Lewiston, NY. A bibliography of those documents, included as part of the Administrative Record, is contained in the ROD. A Responsiveness Summary that documents the public's expressed concerns has also been included.

Description of Selected Remedy:

The selected RAP will control further off-site migration of bedrock groundwater; will remove volatile organic contaminants from site soils and from the soils at the two disposal areas via Soil Vapor Extraction; will remove DNAPL from the bedrock at the northwest portion of the site; and will eliminate the release of potentially contaminated surface water runoff. The RAP is technically feasible to implement, complies with statutory requirements and is protective of public health and the environment. Briefly the selected RAP includes the following:

a. Bedrock Groundwater Extraction with On-Site Treatment

Groundwater extraction wells will be installed for hydraulic containment. The approximate well locations will be to the west and along the southern portion of the site. Stauffer will design, install and monitor a bedrock groundwater collection system to eliminate or minimize the discharge of hazardous constituents in the groundwater to the Forebay/Niagara River. Pumping tests will be conducted on each installed well and the extraction system design will be modified as required to obtain an inward gradient over the calculated capture zone.

Extracted groundwater will be pumped to an on-site treatment facility located at the western end of the former plant site. The treatment facility will consist of a decanting unit for separating any collected DNAPL from aqueous phase liquids, an air stripping unit and if required, activated carbon filters. Following treatment, the water will be discharged to a regulated outfall.

b. Soil Vapor Extraction

An in-situ vacuum extraction system (IVES) will be installed. The IVES will consist of a network of vapor extraction wells arranged on a regular grid over the contaminated areas. Each well would be completed to the bedrock or to the top of the water table.

Initially, a pilot test will be conducted. Vapor extracted during the pilot test will be directed to a carbon system, if necessary, prior to venting to the atmosphere.

Data obtained from the pilot test will be used to determine the radius of influence, the approximate flow rate for the full-scale blower system, and the expected rate of cleanup. These parameters will be used to develop specifications for the actual number of wells required.

c. DNAPL Extraction from Bedrock with On-site or Off-site Treatment.

Monitoring well OW3-89, located in the northwestern corner of the site, will be pumped on a monthly basis or as required to extract any DNAPL collected in the well. The pumped DNAPL will be collected in 55-gallon steel drums. If frequent pumping of OW3-89 is required, a permanent low flow pump will be installed in the well.

d. Surface Water Drainage Controls Over the Plant Site

The surface water drainage controls will include:

- removal of the existing tile drains entering the drainage ditch along the southern perimeter of the site;
- removal and/or blockage of the existing storm sewer system;
- grading of the plant site with the exception of the existing building foundations to promote surface water runoff towards the south and east;
- placing six inches of topsoil over graded areas and revegetating; and

e. Monitoring Program

A general site monitoring program will be developed and implemented for each remedial action. The monitoring program will include groundwater monitoring, surface water monitoring if necessary, seep sampling along the Niagara Gorge, air/water sampling of the overburden monitoring wells located to the northwest of the site, and monitoring of the in-situ vacuum extraction system.

One additional overburden well may be installed to the north near the cemetery caretaker residence. Monitoring of the overburden wells to the northwest of the site will continue on a quarterly basis given that recent sampling results indicate the presence of site related compounds in soil gas samples taken from one of those wells. Additional monitoring points and possible remedial measures may be necessary to the northwest of the site dependent upon further sampling results.

Declaration:

The selected Remedial Action Plan will be protective of public health and the environment and will meet State Standards, Criteria and Guidelines (SCGs) and Federal Applicable, Relevant and Appropriate Requirements (ARARs) with the extraction of contaminants from the overburden and the bedrock groundwater. The remedy will satisfy, to the maximum extent practicable, the statutory preference for remedies that employ treatment that reduces toxicity, mobility or volume as a principle element.

Michael J. O'Toole, Jr.
Acting Deputy Commissioner

7/13/92
Date

ATTACHMENT I

STAUFFER PLANT SITE #932053

Cost Estimates for the Selected Remedial Alternative

Operable Unit	Selected Alernative	Total Estimated Cost (Present Worth)	Estimated Capital Costs	O&M Costs as Present Worth	Estimated Annual O&M Costs
Surfsurface Soils Site & Disposal Areas	IVES	2,876,000	1,300,000	1,576,000	102,000
Surface Water Drainage Control	Surface Water Drainage	508,000	500,000	7,700	500
Groundwater Extraction & Treatment	Extraction Wells	3,481,000	96,000	3,385,000	220,000
DNAPL Extraction Off-Site Incineration	Extraction	138,000	8,000	130,000	8,400
TOTAL		7,003,000	1,904,000	5,098,700	432,900

Attachment II

RESPONSIVENESS SUMMARY

Stauffer Plant Site

Site. No. 932053

Prepared by:

New York State
Department of Environmental Conservation

July 1992

SMC-789 0868

Responsiveness Summary

A public meeting was held on April 30, 1992 at the Lewiston Town Hall in the Town of Lewiston, NY to discuss the results of a Remedial Investigation and Feasibility Study (RI/FS) and to obtain comments from interested citizens concerning the proposed remedial actions for the Stauffer Plant Site. In addition to the public meeting a one month public comment period was available which closed on May 22, 1992. No written comments were received during the public comment period.

Approximately 35 people attended the public hearing for the presentation of the Proposed Remedial Action Plan. This group consisted of four New York State personnel, a few local officials and general citizenry. From actual recorded questions and a review of the hearing record, thirty-three questions were answered. These questions and their written responses are presented below.

1. Q. Why was the site reclassified to Class 2?

   A. Groundwater beneath the site is classified as GA. Class GA water is a source of potable water supply. As per 6 NYCRR Parts 700-705, "Water Quality Regulations for Surface Waters and Groundwaters", the groundwater has been affected by organic contaminants in excess of stated limits. Also, the Niagara River which is a Class AA water body, is a border between the U.S. and Canada and receives contaminated groundwater from the site. The U.S. and Canada have agreed to mandatory reductions in contaminants entering the Niagara River. The conditions of these agreements are noted in the following: The 1987 Niagara River Toxics Management Plan, and the International Joint Commission, Great Lakes Water Quality Agreement of 1978, amended 1987.

2. Q. Can residential areas to north be sampled? Has there ever been any soil testing around the residences to the north?

   A. An overburden monitoring well (OW8-91) was installed on the south side of Riverdale Road just east of Spring Street. Groundwater and air samples (soil gas) are taken from this well on a quarterly basis to monitor for the potential migration of contaminated groundwater from the site and for chemicals that may be volatilizing from the bedrock groundwater. Preliminary results from the March 1992 sampling indicate chemicals were not present in the groundwater but were present in the soil gas. Continued monitoring at that well and any others that may be impacted is necessary.

No soil testing has been done in this residential area as the soils would be expected to be uncontaminated as surface runoff from the site to this residential area has not been documented and the distance from the site is considerable, about 1/4 of a mile. Also, the overburden is very thin and does not support a year-round groundwater table. Water in the overburden migrates downward into the bedrock, thus the overburden groundwater plume is generally limited to the site (when water is present).

3. Q. Is any remedial work scheduled for the residential areas?

A. No work is anticipated for the residential areas other than monitoring north of the site.

4. Q. Will sanitary sewers to the north be checked?

A. Sewer sampling to the north will be part of the design data collection portion of the Remedial Design plan.

5. Q. Were Stauffer's sewers ever connected to the town lines?

A. The sanitary sewers probably were, however, they would have been taken out of service when the plant was demolished in 1980.

6. Q. Is there flow through the present site sewer system?

A. Old storm sewers do exist at the site. Flow from this system goes to the Niagara Gorge via an outfall which is still regulated by the NYSDEC through a SPDES permit. Remedial plans will modify the entire site flow patterns to minimize or eliminate off-site migration of contamination.

7. Q. Is infiltration a problem with the sanitary sewers near the old plant site?

A. There is no information regarding this at the present time. As noted in number 4, above the sewers will be sampled as part of the Remedial Design Plan.

8. Q. Why can't site surface drainage control be done now?

A. Regrading of the site will be done as soon as possible. Design plans must be formulated, reviewed, and approved before implementation. Fortunately, there is no health threatening situation which calls for immediate work.

9. Q. Are overburden soils at the site virgin?

A. Virgin or native overburden soil at the site is present under an average of 4.3 feet of fill material. This fill material consists of silt, sand and gravel with varying amounts of brick, slag, asphalt, stone concrete, wood and clay. The native soils consists of silt and clay lacustrine deposits over a silty, sand and clay glacial till deposit.

10. Q. What concerns are there near the homes regarding soil vapors coming from the site?

A. During the field work at the site, which included borehole and monitoring well installations, air monitoring was conducted. The air monitoring was used to determine the amount of volatile organics which may be normally associated with the site and also associated with the above noted site activities. The results of the air sampling indicated very low levels of organic compounds at the site. These results were used in a computer model to predict the levels which might be found in the residential areas to the north. The results indicate that there is no impact on residential areas downwind of this site. During remedial construction, an approved air monitoring program will be in place to monitor potential impacts on residential areas.

11. Q. Is vacuum extraction a proven remedial method?

A. Yes it is. It is commonly used at petroleum spill sites and is presently being implemented at the Carborundum Company Site #932102 located in Wheatfield, Niagara County.

12. Q. Are metals in groundwater a problem?

A. Metals in groundwater at this site is not a point of concern.

13. Q. Can DNAPL be treated on site?

A. On-site treatment is possible. However, the amount regularly collected will probably govern the feasibility of on-site or off-site treatment. The remedial plans will study the feasibility of various treatment alternatives once volumes of DNAPL can be estimated.

14. Q. Would DNAPL be considered a RCRA waste?

A. DNAPL would be considered as a RCRA waste (i.e. hazardous waste)

15. Q. Were any bedrock wells placed off-site?

A. There are approximately 47 off-site bedrock wells associated with this project. Approximately 19 bedrock wells were placed on-site.

16. Q. How long before the project is complete?

A. After the Record of Decision is signed a remedial work plan must be presented to NYSDEC for review and approval. Some remedial activity may begin in the field in 1992. Remedial construction should be complete by the end of 1993. However, remedial effort in the form of bedrock groundwater extraction and treatment has been projected to last 30 years.

17. Q. Do you anticipate ever getting the site entirely cleaned up?

A. Actual cleanup at the site includes extraction of volatile organics from site soils and from the bedrock groundwater. Site soils can be cleaned to acceptable levels in approximately 5 years. Bedrock groundwater purging is expected to last for 30 years. There are reassessment periods within the 30 year timeframe which will provide for review of remedial effort and results, and which will provide a mechanism for readjustment of the remedial effort. At the present time it is expected that groundwater quality will be at or close to acceptable levels in approximately 30 years.

18. Q. After the cleanup is complete can new sewers be placed through the old plant site.

A. Yes. However, proper health and safety procedures would need to be followed.

19. Q. Was soil contamination found along the north side of the site?

A. Each of the soil borings along the north property line came up clean. Soil contamination is confined to areas south of the north property line of the plant site.

20. Q. Does water move straight down through the overburden?

A. Yes it does. There is no overburden watertable present at the plant site. This indicates that water moves directly down into the bedrock beneath the site.

21. Q. Where will remediated waste residue go?

A. Waste resulting from the remedial effort may consist of extracted DNAPL and spent carbon. The DNAPL could be incinerated either on-site or off-site. The spent carbon likely would be sent off-site for incineration or regeneration. If wastes are treated on-site the proper permitting requirements would need to be met. If wastes are treated off-site, a properly permitted waste handling facility would be used. Such a facility has not yet been chosen.

22. Q. Have you decided on a site for incineration of collected DNAPL?

A. As noted in Question #21, a facility has not yet been chosen for off-site incineration of DNAPL.

23. Q. Regarding capping of the site, does the presence of black topped areas make a difference on capping of the site?

A. The asphalt areas likely will be broken up and regraded prior to capping of the site.

24. Q. There was a well on the southwest portion of the plant site that was to be used for cooling water, but because of sulfur in the water the well was capped. Is there evidence of this well?

A. Not to our knowledge. Any help in locating this well would be appreciated.

25. Q. Has Stauffer voluntarily supplied all pertinent information about the site.

A. Stauffer has been very cooperative in regards to their dealings with DEC, Region 9 personnel.

26. Q. What is the price of work completed and projected work?

A. Work completed to date includes initial studies by the New York Power Authority (NYPA) in 1984 and 1986 and the most recent work completed by Stauffer in 1992. This combined work effort probably has cost between 1 and 2 million dollars.

Projected remedial cost have been placed at approximately 7 million dollars for the life of the project.

27. Q. How much is the taxpayer paying?

A. Very little. Essentially any state monies expended are for salaries for the project coordinators for both DEC and DOH and a few support staff. Much of this money is remanded back to DEC through the Orders on Consent for both the RI/FS and the Remedial Action.

28. Q. Regarding groundwater pumping, since it is projected to last 30 years, what happens after 30 years?

A. Through the Feasibility Study, the remedial effort has been projected for 30 years. If the remediation is not complete at 30 years continued remedial effort will be necessary unless Stauffer can show cause for discontinuance of the remedial effort.

29. Q. What happens if, in 10 years, Stauffer says they have pumped enough. Will the State or Town of Lewiston have to pick up the cost?

A. DEC policy requires that each remedial program be reassessed at least every five years. However, with a properly operating remedial program reassessment can be done quite easily on a more frequent schedule say each 2-3 years. If a responsible party wants to discontinue remedial efforts on a particular aspect of the program, they would need to show the basis for such a request. Court litigation could lead to enforced responsibility on the part of the responsible party or possibly a take over of site remediation by the Superfund Program.

30. Q. Has a perpetual bond been provided by Stauffer to guarantee continued remediation if necessary?

A. A bond has not been provided. There is no such legal requirement at this time.

31. Q. Who chose the consultant to oversee the project?

A. The responsible party for the site chooses their own consultant. However, all remedial plans must be approved by a New York State licensed professional engineer.

32. Q. Who is the consultant?

A. Conestoga-Rovers, Inc. did the RI/FS work for Stauffer. There is the possibility that another consultant may do the actual remediation.

33. Q. Will there be another public hearing or information meeting?

A. A public announcement will be made regarding the Record of Decision. This will be followed by a general mailing informing the public as to the actual start of field work and what can be expected. Future meetings may be held if public interest warrants.

REMEDIAL ACTION PLAN

Stauffer Plant Site

Site No. 932053

Prepared by:

New York State
Department of Environmental Conservation

March 1992

STAUFFER CHEMICAL PLANT SITE
#932053
PROPOSED REMEDIAL ACTION PLAN

TABLE OF CONTENTS

I. SITE LOCATION AND DESCRIPTION

The former Stauffer Chemical Plant site (Stauffer) is located in the southwestern portion of the Town of Lewiston, New York (Figure 1). It lies immediately north of the New York Power Authority's (NYPA) power plant forebay, east of the Niagara Gorge and immediately south of the Riverdale Cemetery (Figure 2). There are two associated disposal areas approximately 500 feet east of the old plant site which are located on vacant (NYPA) property and which were used for disposal of site related debris. These two areas total approximately 1 1/2 to 2 acres and are covered with topsoil and vegetated. The old plant site covers approximately 20 acres and is presently vacant land enclosed by a chain link fence.

General surface topography around the site is somewhat flat with a gradual slope (approximately 1-2%) to the south toward the forebay. The actual plant site is quite level and consists of concrete and asphalt areas (former buildings and roadways) and grassy areas. Three old railroad lines remain in place and most of the storm sewer lines are still intact. A SPDES permit (#NY0001651) remains in effect which monitors site storm water flow to the lower Niagara Gorge. All other service utilities to the plant site had been discontinued when the plant was razed in 1979-80.

Geology at the site is defined by a somewhat thin overburden which consists of miscellaneous fill material overlying native glacio-lacustrine silts, sand and clay. The overburden ranges from zero feet near the forebay wall to 20 feet thick.

The fill at the two former disposal areas ranges from 8 to 17 feet thick and overlies native clays and silts with a thickness of 1 to 2 feet.

The fill and native overburden soils at the site are generally dry to moist. There is no discernible overburden groundwater table at the site.

Bedrock directly beneath the site is the Lockport Dolomite. Its thickness ranges from 45 feet to 75 feet. It is underlain by a series of shale, limestone and sandstone bedrock units which make up the Clinton and Medina Groups and the Queenston Formation. These units are exposed in the Niagara Gorge to the west. The lower Niagara River which is at an elevation difference of approximately 325 feet below the site flows at the elevation of the Queenston Formation. Bedrock groundwater flow is generally southwest toward the forebay and the lower Niagara River.

Land use within a one mile radius of the site is presented in Figure 3. Residential areas within this zone consist primarily of single family units. No residential areas exist adjacent to the site. All residential units are serviced by public water supply.

II. SITE HISTORY

A. From 1900 to 1930, portions of the land now owned by Stauffer were owned and used by the Titanium Alloy Manufacturing Company, the American Magnesium Corporation, and the Niagara Smelting Company. Little has been learned about the activities of these companies at the site. According to data furnished by Stauffer, their plant produced carbon tetrachloride and various metal chlorides from 1930 to 1976. The primary organic chemical feedstock was carbon disulfide which was reacted with chlorine to produce carbon tetrachloride and sulfur chlorides. A pesticide intermediate, parachlorothiophenol, was produced from chlorobenzene and the sulfur chlorides. In addition, methylene chloride and tetrachloroethylene were brought into the plant in bulk and repackaged. The plant ceased operations in 1976 and was razed in 1980. On NYPA property immediately east of the chemical plant, Stauffer used two sites for disposal of generally inert materials including broken concrete, graphite, sand, sulfur, wood pallets, various metal oxides, and plant road and yard sweepings. These two disposal sites are no longer active.

In 1987,a subsidiary of the Stauffer Management Company acquired the site as a result of the divestiture of Stauffer Chemical Company.

B. Previous Investigations

In 1980, the NYPA began studies necessary to prepare an application to the Federal Energy Regulatory Commission (FERC) for expansion of the existing Robert Moses Power Plant which is southwest of the Stauffer site. At that time, the proposed Robert Moses Plant expansion included a portion of the western side of the Stauffer property. Since 1980, the NYPA has conducted two investigations of the Stauffer site and the immediate area to investigate proposed expansion plans for the Robert Moses Power Plant. These studies included the investigation of the presence of Stauffer-associated compounds in the soils and groundwater near the proposed expansion areas. The results of these investigations were presented in two reports entitled, "Application for Amendment to License, Federal Energy Regulatory Commission, Appendices 13 and 14 November 1984" (Bechtel 1984) and "Niagara Power Project Expansion, Report of the Chemical Contamination Field Investigation Conducted in 1985 - 1986" (Bechtel 1986). The investigations determined that "some soil and groundwater contamination had occurred and that some volatile organic compound (VOC) contaminants were migrating in the groundwater system".

1. Bechtel 1984, Report

The (Bechtel 1984) field investigation was initiated in October 1982. The elements of that investigation are presented below.

a. Ground Penetrating Radar (GPR)

A detailed survey was conducted across the western one-third of the former plant site, both inside and outside of the perimeter fence and at the two inactive disposal areas. The survey attempted to located buried objects which might interfere with or present safety hazards during proposed drilling. GPR penetration typically was less than 10 feet due to the high conductivity of the soils in the area.

b. Soil Borings

A total of eighty-eight soil borings were drilled at and around the site and at the two disposal areas (Figure 4). Continuous soil samples were collected for a total of 780 feet of sample. Choice of chemical analysis was based on site related compounds; waste products which were EPA or NYSDEC designated hazardous wastes; or compounds which aid in the determination of the rate and direction of groundwater movement. (See Table 1 for analytical parameters and Figures 4 & 5 for locations or refer to the RI report for extensive analysis).

c. Monitoring Wells - Bedrock

Thirty-seven of the eighty-eight soil borings were extended down into bedrock and completed as bedrock monitoring wells. The deepest screened interval extended to 84.5 feet in depth which is into the lower Lockport Formation. Each well was installed to measure hydraulic heads, determine hydraulic properties and for the collection of groundwater samples. (See Table 1 for analytical parameters and Figure 4 for locations).

d. Seep Sampling

A total of 19 seepage samples were obtained from 22 proposed sampling points. Six of these samples were obtained from the north forebay wall of the NYPA. Twelve samples were collected from along the east wall of the Niagara Gorge immediately west of the Stauffer Site. One sample was collected from a drainage ditch at the west end of the Stauffer Site. (See Table 1 for analytical parameters and Figure 4 for locations).

The Bechtel 1984 study found that soil and groundwater contamination had occurred by reactants, products and other materials derived from the Stauffer Plant. Soil contamination by organic chemicals was found at three locations in excess of 200 ppm. Soil contamination by lead or antimony in excess of background was found at 12 locations. Groundwater contamination was found to be substantial along the western portion of the Stauffer Site.

2. **Bechtel 1986, Report**

For design and engineering reasons, the Robert Moses expansion was to be relocated to the west and southwest of the Stauffer Plant Site. Based on findings of the Bechtel 1984 report, further studies were initiated for the deeper bedrock formations at the alternate expansion site. These studies included:

a. Magnetic Gradiometer Survey

The magnetic survey was conducted west, immediately south and at the southeast corner of the old Stauffer Plant Site. Limited survey work was also conducted along the western edge of the two disposal areas and further east at the Lewiston Pump Generating Plant. The survey was used to determine the possible presence of buried metallic objects, pipes, or utilities. The results indicated that the area is somewhat magnetically noisy, possibly due to the proximity to the power facility and associated transmission lines. The survey did, however, verify the non-existence of any concentration of buried debris such as metallic drums.

b. Soil Borings

A total of sixty soil borings were drilled south and west of the old Stauffer Plant Site. Continuous soil samples were collected for a total of 660 feet of sample. Soils were analyzed in the field using a portable gas chromatograph (GC). Field analysis examined all the GC peaks which would come from the volatile organic compounds (VOC) analyzed for in samples which were sent to the laboratory. Based on GC results, approximately forty soil samples were sent to a laboratory for further analysis. Table 2 indicates the parameters which were analyzed for along with the method of analysis. Figure 5 indicates the locations of the soil borings.

c. Monitoring Wells - Bedrock

Approximately eighteen additional monitoring wells were installed to provide more data from the deeper bedrock formations. These wells were installed in the lower Lockport Formation, the Lockport/Rochester Formation contact, the Rochester Formation, the Irondequoit/Reynales Formation contact, the Grimbsy/Power Glen Formation contact and within the Queenston Formation. The deepest screened interval was set at approximately 450' below the elevation of the old Stauffer Plant site. Due to inadequate water volume, the deepest sampled interval was at 213 feet below ground level. Table 2 indicates the parameters analyzed for and Figure 6 indicates the locations of the monitoring wells. Permeability testing was also conducted at each well.

The Bechtel 1986 study showed that soil contamination (>1 ppm, organics) was found at four limited areas south and west of the Stauffer Plant site. This amounted to approximately 300 cubic yards of soil. Overburden groundwater was not encountered. However, bedrock groundwater beneath and west of the Stauffer Plant site was found to be contaminated with several volatile organic compounds with concentrations up to 510 ppm. These contaminants were found in all bedrock units sampled.

Subsequent to these investigations and based upon their findings and the changing economic/energy situation, NYPA abandoned all proposed expansion work in the area of the Stauffer Plant site. The expansion would now be concentrated at the Lewiston Pump Generating Plant considerably east of the Stauffer Plant site.

3. In September 1986, Stauffer Chemical Company and DEC met to discuss the plant site situation. In 1987, a subsidiary of the Stauffer Management Company acquired the site as a result of the divestiture of Stauffer Chemical Company. Since then, the Stauffer Management Company contracted with Conestoga-Rovers and Associates, Waterloo, Ontario, Canada, to develop a work plan for further investigations at the site. This work plan was approved by the DEC in May 1988. Subsequently, on December 22, 1988, a Consent Order was executed between the NYSDEC and Stauffer for development and implementation of a Remedial Investigation and Feasibility Study (RI/FS). This work was done with oversite from DEC Region 9 personnel between August 1989 and April 1990.

   To finalize the RI, a "Supplemental Data Collection Plan" (SDCP) dated November 1990 was developed and approved with field work being done in March and April of 1991. Along with previously gathered NYPA data, the results of the RI and the SDCP are contained in a report titled "Final Site Investigation Report, Stauffer Management Company, April 1991".

4. The elements of the Final Site Investigation Report include:

   a. <u>Site-Specific Parameter List (SSPL)</u>

      From the information gathered during the 1984 and 1986 NYPA investigations, a list of parameters was established which typically were found and which are site related. This Site-Specific Parameter List (SSPL) (Table 3) was used during sampling of approximately 75% of the sampling points at the site. The remaining 25% of the sampling points were sampled for the full USEPA Contract Laboratory Program (CLP) Exhibit C Target Compound List (TCL) organics and Target Analyte List (TAL) metals.

   b. <u>Radioactivity Survey</u>

      Because slag possibly containing low levels of radioactivity was believed to have been used on site, readings were taken for background (0.02 to 0.04 mRem/hr) and during all overburden drilling operations. Readings at the boreholes ranged from 0.05 to 0.15 mRem/hr which is well below the 1.0 mRem/hr action level.

   c. <u>Soil Borings</u>

      Twenty-nine soil borings were drilled within the fenced site boundary and ten boreholes were drilled at the two Disposal Areas. Site soil borings are noted on figure 7 while the Disposal Area borings are noted on figure 8.

d. Monitoring Well Installations

Six new bedrock wells were installed to further define bedrock hydrogeologic conditions at areas not previously investigated. One overburden well was installed on site while three were installed northwest of the site to assess groundwater quality toward the residential area (Figure 9). Where overburden groundwater was absent, borehole air samples were taken.

e. DNAPL Testing

Twelve monitoring wells which contained the highest contaminant concentrations were tested for the presence of dense non-aqueous phase liquid (DNAPL).

f. Seep and Surface Water Sampling

Seep and surface water was sampled based upon noted seepage at the time of inspection. Sampling was conducted along the NYPA Forebay, the Niagara Gorge and at the former plant site. Many of these locations coincided with previously sampled locations (see Figure 10).

III. CURRENT STATUS

A. Remedial Investigation/Supplementary Data Collection Plan

The Remedial Investigation (RI) was designed to finalize investigations previously conducted by NYPA. Lacking from previous work was a complete characterization of site soils and disposal area soils. Also lacking was the vertical definition of bedrock groundwater contamination. With the RI finally completed, the Risk Assessment and Feasibility Study were concluded.

Of primary concern at this site are volatile organic compounds predominantly those used during plant operations. For this reason, a Site Specific Parameter List (SSPL) of eight compounds was established to better characterize contaminant movement and extent (Table 3). In many instances, new sampling points or questionable sampling points were subjected to full TCL/TAL analysis. The RI is a compilation of information obtained from previous NYPA work and from work conducted by Conestoga-Rovers Associates for Stauffer. A total summary of analysis was compiled from on-site and off-site sampling of soil borings, overburden and bedrock groundwater, seep and surface water points and storm sewers.

As noted earlier, the Stauffer Plant site is situated directly north of the NYPA Forebay Canal and just east of the Niagara River Gorge. The surficial deposits consist of fill material over glacio-lacustrine overburden. Average combined thickness of the surficial deposits is approximately 10 feet. Due to the proximity of the site to the Forebay Canal, there is no permanent groundwater table within these surficial deposits. The average water elevation within the adjacent Forebay Canal is approximately 50 feet below the ground surface at the site (Figure 11). Of the four overburden wells installed, only two had sufficient water for sampling. The sampled off-site well (OW 8-91) was free of contamination. The one on-site well (OW 7-89) had volatile organics with a high of 160 ppm for carbon tetrachloride. For the two off-site wells with insufficient water, soil air samples were obtained. Both wells were free of contamination. With the general absence of an overburden groundwater table, contamination within the overburden appears to be confined to the Stauffer Plant site and the two Disposal Areas.

Additional soil boring at the site and at the two Disposal Areas indicated the presence of site related compounds. The northwestern portion of the site contained the highest concentrations with compounds such as carbon tetrachloride, tetrachloroethene, and chloroform at concentrations up to 37 ppm, 7.1 ppm and 13 ppm respectively (Tables 4 & 5).

At the two Disposal Areas, maximum soil concentrations were carbon disulfide at 34 ppm, tetrachloroethene at 130 ppm, carbon tetrachloride at 3.0 ppm, methylene chloride at 10 ppm, and chloroform at 2.0 ppm. Silver, magnesium, and antimony were also reported at elevated levels (Tables 6 & 7).

The bedrock at the site is a thick succession of sedimentary rocks. The dip or angle of bedding is toward the south at approximately 40 feet per mile. The stratigraphic section beneath the site is presented in Figure 12.

A number of hydrogeologic units have been identified at the Stauffer site. Due to the proximity of the site to the NYPA Forebay Canal and the Niagara Gorge, it is believed that natural stress relief within the bedrock and disturbance from construction of the NYPA Power Plant have produced more vertical hydraulic connections then ordinarily found in the bedrock. This is evidenced by the findings of site related chemistry at depth below the site.

The RI has found that there are four main bedrock hydrogeologic units at the site. These units and their hydrogeologic flow characteristics are presented in Table 8. As noted in Table 8, groundwater flow is to the south and southwest toward the Forebay Canal and the Niagara Gorge respectively. The lower bedrock units at the site were found to be very low yielding with respect to groundwater movement.

There are four major features which influence the hydrogeologic system at the site. These are the Niagara Gorge, the NYPA Forebay, a grout curtain installed in the bedrock for the power plant, and two drainage tunnels beneath the NYPA Power Plant (Figure 13). The Niagara Gorge, the NYPA Forebay, and the two tunnels each act as discharge zones for both shallow and deep bedrock water bearing zones.

The location of the bedrock grout curtain is such that it inhibits the movement of groundwater to the three discharge features noted above. The effect is to maintain a pool of contaminated bedrock groundwater to the east and north of the grout curtain which is the area directly west of the Stauffer site.

This is evident when looking at concentrations of Total Volatile Organics in the bedrock beneath and to the west of the Stauffer site (Figures 14 & 15). Values as high as 317,000 ppb (W-17); 55,000 ppb (LR-2); 1,318,000 ppb (OW 3-89); 53,400 ppb (IR-49); and 111,000 ppb (GPG-51, 1986) have been found in the Lockport, Lockport/Rochester, Rochester, Reynales and Medina Formations respectively. (Individual well analysis are contained in the RI.)

On the west and south side of the grout curtain, Total Volatile concentrations are orders of magnitude lower as measured in Gorge Face and Forebay Seeps (Figure 4 & Table 9). Highest Total SSPL, Total Organic values noted at the Gorge Face Seeps and Forebay Seeps are 358 ppb (G-1) and 27 ppb (F-4) respectively.

Surface water sampling indicates a high of 4,740 ppb of Total SSPL Volatile Organics at (S-3), (Table 9).

During the Supplemental Data Collection Program, two wells (OW 3-89 & OW 7-89) were found to contain Dense Non-Aqueous Phase Liquid (DNAPL). Analysis at (OW 3-89) indicates Total Organic Compounds at 531,000 ppm.

B. Health Risk Assessment (RA)

In preparing the RA, Stauffer identified site related chemicals in the groundwater beneath the site, in the subsurface soils and in the surface water adjacent to the site. Based on the data collected during the RI, it has been concluded that the chemicals of concern at this site consist of the previously identified SSPL compounds (Table 3). The primary chemicals of concern, based on frequency of detection, reported concentration and toxicity are carbon tetrachloride, tetrachloroethene, chloroform and benzene. Trichloroethene and methylene chloride are also suspect carcinogenic chemicals at the site. The major transport mechanism is via the groundwater. Other potential transport mechanisms include surface water runoff, sewer system flow to the west, and air transport of volatiles from site soils.

Potential exposure pathways identified at the site include:

1. Groundwater to the Niagara River/Forebay:

   - Drinking water
   - Swimming
   - Ingestion of fish
   - Environmental exposure to fish and wildlife

2. Groundwater seeps on the gorge face:

   - Dermal contact by fishermen
   - inadvertent ingestion of soil/water by fisherman

3. Surface water:

- Dermal contact by children wading
- Inadvertent ingestion of water during play

4. Ambient air:

- Inhalation by residents or site workers

5. Subsurface soils exposed on surface:

- Dermal contact
- Inadvertent ingestion

As noted earlier in the summary, an overburden groundwater regime does not exist at the site. Risk scenarios were then developed for the remaining exposure pathways.

Potential exposure scenarios were developed from USEPA documents entitled "Risk Assessment Guidance for Superfund" and "Exposure Factors Handbook". In developing potential risk scenarios the most conservative assumptions were employed.

[NOTE: In general, regulatory agencies in the United States have not established a uniform cancer risk level for distinguishing between risks which are deemed acceptable and those which may be of concern. The EPA has generally considered risks in the range of one in ten thousand (1×10^{-4}) to one in ten million (1×10^{-7}) to be acceptable, and has recently adopted a risk level of one in a million (1×10^{-6}) as a "point of departure" for selecting the risk level that will be considered acceptable (EPA 1990)].

Estimated risk associated with potential exposure to <u>non-carcinogenic</u> chemicals is expressed as the ratio of the estimated exposure to the smallest exposure that might possibly cause adverse effects. The ratio is called a Hazard Index. A hazard index greater than one indicates that adverse effects may be possible while a value less than one means that adverse effects would not be likely to occur.

For the exposure scenarios developed, it was found that the estimated lifetime cancer risk ranged from five in one billion (5×10^{-9}) to two in one hundred thousand (2×10^{-5}) which is below the range of risk noted above. The Hazard Index values for non-carcinogenic risks were well below 1.0, the level of concern.

Therefore, The RA indicates that under existing conditions potential exposure to chlorinated compounds via airborn pathways, contact with soils at the site or contact with groundwater seeps at the Niagara Gorge does not pose any significant threat to human health. Groundwater in the affected area is not used for domestic purposes and there are no homes with private wells or basements located in the affected area. Consequently there is no estimated risk applicable to local residents.

IV. ENFORCEMENT STATUS

Under Article 27 of the Environmental Conservation Law (ECL) entitled "Inactive Hazardous Waste Disposal Sites", the (NYSDEC) and the Stauffer Management Company entered into an Order on Consent, (Index #B9-0137-86-04). The Order was signed by Commissioner Thomas C. Jorling on December 12, 1988. The Order essentially stipulates that Stauffer will develop and implement a Remedial Investigation and Feasibility Study for an Inactive Hazardous Waste Disposal Site.

A second Order on Consent is being negotiated for the development and implementation, monitoring and maintenance of the selected remedial alternative. A draft Order was initially presented to Stauffer on October 31, 1991.

V. GOALS FOR THE REMEDIAL ACTIONS

The overall goal of site remediation is to ensure the protection of human health and the environment. The remedial objectives of this program are to:

1. Eliminate or minimize the discharge of hazardous constituents in the groundwater to the Forebay/Niagara River.
2. Reduce concentrations of hazardous constituents within soil and groundwater with time to acceptable State and Federal levels consistent with the anticipated use of the property.
3. Minimize the potential human contact with waste constituents in soils, surface water and seeps.
4. Minimize the potential exposure of workers and nearby residents to chemicals via air pathways.
5. Minimize the need for future remediation and operation and maintenance activities.
6. Eliminate or minimize risks or impacts to natural resources.

Remedial action objectives have been developed in the RI to be protective of human health and the environment for all exposure pathways and to comply with applicable Standards, Criteria and Guidelines (SCG's). The requirement for groundwater remediation is driven by SCGs which include requirements of the 1987 Niagara River Toxics Management Plan (NRTMP) and the International Joint Commission (IJC), Great Lakes Water Quality Agreement of 1978, amended 1987. NYSDEC remediation goals are to attain New York State groundwater standards throughout the contaminated plume. However, recent data from various groundwater remediation programs has documented the difficulty of achieving restrictive groundwater standards at and near contaminant sources. Consequently, control over the flow of groundwater, that is -- to maintain an inward gradient to the extent practicable, will be a remedial goal. Realization of this goal through implementation of the proposed remedies would prevent approximately 96 percent of site related compounds from reaching the Niagara River.

SCGs are categorized as chemical-specific, location-specific and action-specific. Chemical specific SCGs for the site potentially apply to soils, surface water, groundwater and air. Currently, there are no standards for soils. However, the DEC technology section has reviewed pertinent data on soils and has concluded that a cleanup goal of less than 10 ppm for total volatiles in soils may be acceptable. Table 14 presents suggested soil cleanup goals for the SSPL compounds. Site Specific Parameter maximum contaminant levels (MCLs) have been established for groundwater and surface water (Table 10). SCGs for air are provided in (Table 11).

Location-specific SCGs at this site apply to streams or rivers and to national wild, scenic or recreational rivers. The potential New York State SCG is, Use and Protection of Waters (6NYCRR Part 608). The corresponding federal SCGs include, Fish and Wildlife Coordination Act (40 CFR 6.302), and Wild and Scenic Rivers Act [40 CFR 6.302(e)].

Action-specific SCGs which might regulate various remedial alternatives are noted in Table 12.

VI. SUMMARY OF THE EVALUATION OF REMEDIAL ALTERNATIVES

The Feasibility Study has taken into consideration regulations established by the State and Federal governments which deal with the remediation of inactive hazardous waste sites. As such, it is required that the selected remedial alternative for a site be protective of human health and the environment, cost effective, and comply with statutory requirements.

A. Screening of Alternatives

A number of technologies and process options were screened based upon effectiveness in accomplishing the previously stated remedial objectives. Table 13 presents eleven response actions preliminarily screened which deal with site soils, groundwater, surface water, and DNAPL.

Further screening of technologies and process options provided the following remedial alternatives:

1. Description and Screening of Remedial Alternatives for Subsurface Soils

   a. No Action - This would require no additional action other than monitoring following the RI/FS.

   b. Institutional Controls - Deed restrictions and access control to selected areas of the site.

   c. Partial Capping - Placement of a cap over areas T-4, A, B and C (Figure 16). This cap might be a RCRA cap; a clay cap consistent with NYSDEC standards; or asphalt/clay cap.

d. Excavation/Consolidation/Capping - Excavation of potentially contaminated soil from areas B, C and T-4, and placement in area A. Area A would then be capped with an asphalt/clay cap or a RCRA cap.

e. Removal/On-Site Treatment/Disposal - Excavation of approximately 75,000 cubic yards of potentially contaminated soil and treatment using one of the following: land farming, vacuum extraction, low temperature thermal extraction, incineration or solvent extraction. The treated soils would then be disposed on site in an environmentally sound manner.

f. Capping Area A/Removal From Areas B, C and T-4 With Off-Site Incineration - Excavation of approximately 18,000 cubic yards of soil from areas B, C and T-4 with transportation to an off-site facility for incineration. Area A would be capped with either an asphalt/clay cap or a RCRA cap.

g. Capping Area A/Removal From Areas B, C and T-4 With Off-Site Disposal Essentially the same as above except that some on-site pretreatment prior to off-site landfilling may be necessary. Types of on-site treatment were previously stated in (e) above.

h. In Situ Vacuum Extraction - Installation of a system of shallow overburden soil gas extraction wells into each of the four identified soil areas. A vacuum would be exerted on each well to induce air flow through the soil, stripping volatile organics from the soils. The captured organic vapors could be emitted directly to the atmosphere or directed through activated carbon canisters.

2. Description and Screening of Remedial Alternatives for Groundwater

a. No Action - No additional actions other than monitoring following completion of the RI/FS.

b. Institutional Controls - Restricting the groundwater to non-potable uses both beneath the site and downgradient of the site.

c. Groundwater Extraction/On-Site Treatment/Discharge to POTW - Installation of approximately three to eight groundwater extraction wells west and along the southern portion of the site. Well depth will be to the lower contact of the Rochester Shale. Extracted water would be treated on site by carbon adsorption, air stripping, aeration, UV oxidation or biological treatment. Treated water would be discharged to the Town of Lewiston sewage treatment plant.

d. Groundwater Extraction/On-Site Treatment/Discharge to Groundwater on Site - This alternative is the same as (c) above except that treated water would be discharged back to groundwater by a recharge pond or injection wells east of the site.

e. Groundwater Extraction/On-Site Treatment/Discharge to Surface Water This alternative is the same as (c) and (d) above except that treated water is discharged to a surface water location. A SPDES permit modification would be necessary.

f. Groundwater Extraction/On-Site Treatment/Disposal/Extend Grout Curtain - Extension of the grout curtain along the forebay for an additional 1,200 feet to reduce the hydraulic connection between the groundwater collection system and the forebay. Extraction wells and a treatment facility would be included. Discharge of treated water would be as noted in (c), (d) or (e) above.

3. Description and Screening of Remedial Alternatives for Surface Water Drainage Control

   a. No Action - This would require no further action other than monitoring following completion of the RI/FS.

   b. Institutional Controls - Restrict access to the identified surface water drainage areas currently accessible to the public.

   c. Surface Water Drainage Controls - The existing site storm system would be removed and/or plugged and the site graded over. Topsoil and vegetation cover over the regraded site would promote sheet flow off site negating the need for a SPDES permit.

4. Description of Screening of Remedial Alternatives for DNAPL

   a. No Action - This alternative would not involve any further action other than monitoring following completion of the RI/FS.

   b. DNAPL Extraction/Off-Site Incineration - Installation of a pump in well OW3-89 to remove DNAPL collected in this well on a regular basis. Collected DNAPL would be sent off site for incineration.

   c. DNAPL Extraction/On-site Incineration - Same as (b) above except for on-site incineration if on-site incineration of soils was also being conducted.

B. The Preferred Alternative

Remedial actions at the old Stauffer Plant site and at the two disposal areas include attention to subsurface soils, bedrock groundwater, surface water and DNAPL in bedrock. In this regard, the preferred alternative for this site is:

- In situ vacuum extraction on contaminated soils
- Bedrock groundwater extraction with on-site treatment
- Surface water drainage controls over the plant site
- DNAPL extraction from bedrock with on-site or off-site treatment

Vacuum Extraction

An in-situ vacuum extraction system (IVES) would be installed at each of the four chemically affected soil areas (Areas A, B, C and T-4) as presented on Figure 16. The IVES would consist of a network of vapor extraction wells arranged on a regular grid over the contaminated areas.

Based on chemical concentrations and hydrogeologic conditions at the site, it is estimated that the vapor wells would be spaced approximately 40 feet apart, which would require approximately 150 wells in total for the four areas. Each well would be completed to the bedrock or to the top of the water table.

Initially, a pilot test would be conducted. Vapor extracted during the pilot test would be directed to a carbon system, if necessary, prior to venting to the atmosphere.

Data obtained from the pilot test would be used to determine the radius of influence, the approximate flow rate for the full-scale blower system, and the expected rate of cleanup. These parameters would be used to develop specifications for the actual number of wells required.

If the pilot study ultimately finds that in-situ vacuum extraction is not effective at this site other technologies may be employed, (i.e., capping, low temperature thermal extraction, incineration).

Bedrock Groundwater Extraction With On-Site Treatment

Groundwater extraction wells would be installed for hydraulic containment. The approximate well locations will be to the west and along the southern portion of the site. Stauffer will design, install and monitor a bedrock groundwater collection system to eliminate or minimize the discharge of hazardous constituents in the groundwater to the Forebay/Niagara River. The estimated groundwater capture zone is presented on figure 17. Pump tests will be conducted on each installed well and the extraction system design will be modified as required to obtain an inward gradient over the calculated capture zone presented.

Extracted groundwater would be pumped to an on-site treatment facility located at the western end of the former plant site. The treatment facility would consist of a decanting unit for separating any collected DNAPL from aqueous phase liquids, an air stripping unit and if required, activated carbon filters. Following treatment, the water would be discharged to a regulated outfall.

Surface Water Drainage Controls Over The Plant Site

The surface water drainage controls would include:

- removal of the existing tile drains entering the drainage ditch along the southern perimeter of the site;
- removal and/or blockage of the existing storm sewer system;
- grading of the plant site with the exception of the existing building foundations to promote surface water runoff towards the south and east;

- placing six inches of topsoil over graded areas and revegetating; and

DNAPL Extraction From Bedrock With On-Site or Off-Site Treatment

Monitoring well OW3-89, located in the northwestern corner of the site, would be pumped on a monthly basis or as required to extract any DNAPL collected in the well. The pumped DNAPL would be collected in 55-gallon steel drums. If frequent pumping of OW3-89 is required, a permanent low flow pump would be installed in the well.

Monitoring Program

A general site monitoring program will be developed and implemented for each remedial action. The monitoring program will include groundwater monitoring, surface water monitoring if necessary , seep sampling along the Niagara Gorge, air/water sampling of the overburden monitoring wells located to the northwest of the site, and monitoring of the in-situ vacuum extraction system.

One additional overburden well may be installed near the cemetery caretaker residence. Monitoring of the four wells to the northwest of the site will continue on a quarterly basis given that recent sampling results indicate the presence of site related compounds in soil gas taken from one of those wells. Additional monitoring points and possible remedial measures may be necessary to the northwest of the site dependent upon further sampling results.

C. Rationale for Selection

The final alternatives were evaluated against the following eight (8) criteria: Compliance with New York State Standards; Criteria and Guidelines (SCGs); Reduction of Toxicity, Mobility or Volume; Short-Term Impacts; Long-Term Effectiveness and Permanance; Implementability; Cost; Community Acceptance; and Overall Protection of Human Health and the Environment.

Compliance With SCGs

- Since the IVES will reduce concentrations of chemicals in the soils, it is expected that chemical concentrations in the surface water runoff will also be reduced. Site related compounds would continue to migrate to the groundwater until the IVES has reduced the chemical concentrations in the soil to target levels.

- The bedrock groundwater pumping and treatment would decrease chemical contamination in the groundwater to levels which may ultimately meet New York State standards for Class GA groundwater. However, it is expected that the SCGs for Class GA groundwater may be difficult to meet. Therefore, the objective would be hydraulic containment of the contaminant plume. The onsite treatment plant effluent will be handled in accordance with all applicable DEC regulations.

- Surface water SCGs would be met due to the elimination of the storm drainage system.

- Containers of DNAPL would be managed and stored in accordance with 40CFR 264.173 and 6NYCRR Subpart 373.1. Transport of this material to an off-site facility would be conducted in accordance with 40CFR 263 and 6NYCRR Part 372.

Overall Protection of Human Health and the Environment

- Treatment of soils by IVES would permanently remove the potential risks associated with soils at the site.

- The potential risk from chemicals in the groundwater would be reduced by permanent removal of chemicals from this medium. Hydraulic containment to prevent migration of contaminants and instutitional controls can be implemented to protect public health and the environment.

- Surface water drainage controls would reduce chemical concentrations in the surface water runoff and eliminate the current potential exposure locations to chemicals in the surface water.

- Removal and treatment of DNAPL will eliminate any effects on human health or the environment at this site.

Short-Term Impacts and Effectiveness

- The IVES would reduce the potential exposure of residents and workers to chemicals in the subsurface soils immediately upon implementation as the flow of chemicals in the vapor phase will be downward toward the extraction wells. Worker exposure may occur during system installation. During construction, chemicals may be released via dust or volatilization. Proper worker protection, environmentally sound construction techniques and adequate monitoring will be necessary to mitigate potentially harmful chemical releases.

- Exposure of workers to potentially contaminated groundwater may occur during installation of the groundwater extraction wells and the forcemain and discharge line. As previously noted, proper worker protection, environmentally sound construction techniques and adequate monitoring will be necessary to mitigate potentially harmfull chemical releases.

- Grading activities for surface drainage remediation may result in the release of small quantities of VOCs to the atmosphere. Workers would be required to wear protective equipment and utilize safe construction practices to minimize potential releases of contaminants to the atmosphere. An air monitoring program will be necessary to monitor for fugitive dust particles or contaminant releases.

- Removal and incineration of DNAPL will begin an immediate reduction of contaminants available to the environment.

Long-Term Effectiveness and Permanence

- A long-term monitoring program will be implemented with program review every five years.

- The IVES would permanently reduce the amount of chemicals in the soils by approximately 88 percent (assuming a 90 percent efficiency for the IVES). The resulting potential cancer risk from the remaining chemicals at the site would be well below the estimated risk level of one in one million (1.0×10^{-6}).

- Bedrock groundwater extraction would ultimately reduce the amount of chemicals in the groundwater.

- Movement of contaminants in surface water will be essentially eliminated. An inspection and maintenance program would be implemented to ensure continued proper drainage from the site.

- Removal and treatment of DNAPL from groundwater will permanently reduce the contaminants available to the environment.

Reduction of Toxicity, Mobility and Volume

- The IVES treatment will reduce the amount of chemicals in the soil by approximately 88 percent and would limit mobilization of chemicals from the soils to the groundwater.

- Extraction and treatment of groundwater will permanently remove and reduce the amount of contamination in the bedrock groundwater regime. Groundwater flow toward the seeps will be reduced or eliminated.

- DNAPL extraction would permanently remove concentrated chemicals present in the groundwater.

Implementation

- Several firms are currently available which specialize in IVES design and construction. The activities involved in the implementation all involve common practices. A pilot test would be required to finalize the design parameters for the IVES.

- Implementation of the bedrock groundwater extraction system would involve common construction practices. Pump tests would be required to finalize the number and the design of the extraction wells and treatment system. A pilot test would be required to finalize the design parameters for the treatment facility. Coordination would be required with the NYSDEC and NYPA during construction work and with NYSDEC for a SPDES permit for treated effluent.

- The surface water drainage controls and the DNAPL extraction can be readily implemented.

Cost

- See Table 15 for cost estimates for the Selected Remedial Alternative. Complete tabulations of costs for construction, engineering, contingency, and operation and maintenance are presented in Appendix H of the Feasibility Study and Tables 3 to 5 of the "Description and Evaluation of Supplemental Remedial Alternatives, 2/18/92".

Community Acceptance

- Community concerns are expected to focus on the remedial alternative which will be most protective of public health. A full assessment of community attitudes toward the preferred alternative and the other alternatives will be made following the formal public comment period and informational meeting.

VII. SUMMARY OF GOVERNMENT'S POSITION

The basis for the government's position is Article 27, Title 13 of the Environmental Conservation Law. A public meeting will be scheduled for April 1992 to present the Proposed Remedial Action Plan (PRAP). A responsiveness summary will be prepared addressing the comments and recommendations of the responsible parties and the public.

From information gathered to date and evaluations of each of the proposed remedial alternatives, the NYSDEC and NYSDOH believe that the preferred alternative will be protective of human health and the environment, will meet existing applicable or relevant and appropriate requirements of Federal and State statutes, and will be cost effective.

A bibliography of significant points in the RI/FS process with Stauffer Management Company is listed in the Administrative Record.

APPENDIX A - LIST OF FIGURES

APPENDIX B - LIST OF TABLES

APPENDIX C - LIST OF ACRONYMS

NYSDEC	New York State Department of Environmental Conservation
EPA	Environmental Protection Agency
SPDES	State Pollutant Discharge Elimination System
ppm	Parts Per Million
ppb	Part Per Billion
GC	Gas Chromatograph
RI/FS	Remedial Investigation and Feasibility Study
SDCP	Supplemental Data Collection Plan
SSPL	Site-Specific Parameter List
CLP	Contract Laboratory Program
TCL	Target Compound List
TAL	Target Analyte List
DNAPL	Dense Non-Aqueous Phase Liquid
ECL	Environmental Conservation Law
SCGs	Standards, Criteria and Guidelines
MCL	Maximum Contaminant Level
RCRA	Resource Conservation and Recovery Act
IVES	In-Situ Vacuum Extraction System

APPENDIX D - REFERENCES

Bechtel National Inc., "Assessment of Potential Chemical Contamination for the Niagara Project Expansion", Niagara Power Project Expansion, Volume III Appendices 1 through 3, Power Authority of the State of New York, May, 1984.

Bechtel National Inc., "Niagara Power Project Expansion - Report of the Chemical Contamination Field Investigation Conducted in 1985-1986", the New York Power Authority, August, 1986.

Conestoga-Rovers & Associates Inc., "Work Plan, Stauffer Management Company, Niagara Falls Site", Stauffer Management Company, May 1988.

Conestoga-Rovers & Associates Inc., "Final Site Investigation Report", Stauffer Management Company, April 1991.

Conestoga-Rovers & Associates, Inc., "Supplementary Site Investigation Report", Stauffer Management Company, August 1991.

Conestoga-Rovers & Associates Inc., "Feasibility Study", Stauffer Management Company, September 1991.

Conestoga-Rovers & Associates Inc., "Description and Evaluation of Supplemental Remedial Alternatives, February 18, 1992.

ICI Americas Inc., "Remedial Proposal", January 13, 1992

"Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA", EPA/540/G-89/004, OSWER Directive 9355.3-01, October 1988 (EPA RI/FS Guidance Document).

"Technical and Administrative Guidance Memorandum (TAGM) for the Selection of Remedial Actions at Inactive Hazardous Waste Sites", NYSDEC, HWR-90-4030, May 15, 1990.

USEPA Guidance Document, "Risk Assessment Guidance for Superfund" [(RAGS) Interim Final, December 1989]

Niagara River Toxics Management Plan (NRTMP) 1987, "Declaration of Intent", United States EPA, Environment Canada, NYSDEC, Ontario Ministry of the Environment.

Revised Great Lakes Water Quality Agreement of 1978 as amended by Protocol signed November 18, 1987 by International Joint Commission, United States and Canada.

APPENDIX E - Administrative Record

STAUFFER MANAGEMENT CO. #932053

11/16/78	Letter, Stauffer to DEC, submit NYS Hazardous Waste survey.
1976	Stauffer Plant Operations ceased
1980	Stauffer Plant Razed.
7/82	Letter, NYPA to DEC, submit Preliminary Expansion Project Description
7/28/82	Meeting, DEC/NYPA, Initial Discussion on NYPA Expansion.
9/9-10/82	Meeting, NYPA/All involved agencies, NYPA presented Scope of Expansion.
3/3/83	Letter, NYPA to DEC, submit reports on expansion investigation
4/20/83	Meeting, DEC/NYPA/Bechtel, Proposed field work
9/26/83	Meeting, DEC/NCHD/NYPA, Field work progress.
8/15/84	Public meeting on NYPA Expansion
9/24/84	Letter DEC to NYPA comments on Draft Application for Expansion Project.
12/84	Letter, NYPA to DEC, submit formal application for License Amendment for NYPA Expansion (FERC #2216)
5/29/85	Public meeting, comment & information meeting on NYPA Expansion
9/3/85	Letter, NYPA to DEC, 1984 Sampling Analysis
9/18/85	Meeting, NYPA/DEC, Changes in Expansion (reduction in scope)
12/17/86	Letter, Stauffer to DEC, proposal for additional investigations at the Stauffer Plant Site.
12/11/87	Report, Preliminary Assessment, State Power Authority, by NUS Corp.
2/24/88	Letter, ICI to DEC Submit work plan for Stauffer site.
3/7/88	Meeting, DEC/Stauffer/DOH/CRA, Work Plan

3/28/88	Letter, DOH to DEC, comments on Work Plan
7/6/88	Letter, DEC to ICI, final comments on Work Plan dated 5/88.
8/30/88	Addendum, ICI to DEC, Addendum to Work Plan of 5/88, dated 8/23/88
12/22/88	Order on Consent for RI/FS, signed by DEC Commissioner T.C. Jorling.
4/21/89	Report, ICI to DEC, Health & Safety/Quality Assurance Quality Control (H&S/QAQC)
4/26/89	Letter, CRA to NYPA, Request for access to NYPA property for RI/FS work.
6/15/89	Letter, DEC-ICI, comments on H&S/QAQC Plan.
6/30/89	Letter P. Nelson (DEC) to public, field work notification for RI/FS.
7/17/89	Plan, ICI to DEC, revised H&S/QAQC
7/19/89	Plan, ICI to DEC, Revised H&S/QAQC
7/31/89	Letter, DEC to ICI, Comments on revised H&S/QAQC plan of 7/17/89
5/30/80	Report, ICI to DEC, submit Site Investigation Report.
6/6/90	Letter, DEC to Lewiston Public Library, submit Site Investigation Report to public repository.
7/30/90	Project review in Albany DEC Offices.
9/14/90	Meeting, DEC/NCHD/NCIDA, Niagara County Industrial Development Agency proposal for Stauffer site.
9/19/90	Letter, DEC to ICI comments on RI.
10/29/90	Meeting, DEC/ICI/CRA, Remedial Investigation
11/15/90	Report, ICI to DEC, submit Work Plan for additional work at site.
11/19/90	Report ICI to DEC, submit Revised Work Plan for additional work at site.
12/12/90	Letter, DEC to ICI, comments on CRA responses to DEC comments of 9/19/90 and review of SDCP of 11/19/90.
2/19/91	Letter, ICI to DEC, response to DEC comments of

	12/12/90 on SDCP
3/19/91	Letter DEC to ICI, approval of ICI 2/19/91 responses (with exceptions)
4/12/91	Plan, ICI to DEC, submit Scoping Plan for Feasibility Study (FS)
5/1/91	Report, ICI to DEC, submit Final Site Investigation Report
5/7/91	Letter, DEC to ICI, comments on FS Scoping Plan.
5/23/91	Report, ICI to DEC, submit Site Characterization Fact Sheet.
5/23/91	Public Update, DEC to Public, Notice of Project Update
6/17/91	Letter, DEC to ICI, approval of ICI 5/1/91 response to DEC comments of 9/19/90 on Final Site Investigation.
7/8/91	Letter, ICI to DEC, response to DEC comments of 5/7/91 on FS Scoping plan.
7/29/91	Letter, DEC to ICI, approval of ICI response to comments of 7/8/91.
8/16/91	Report, ICI to DEC, submit Supplemental Site Investigation Report on Soil Air Sampling of northwest overburden wells.
8/16/91	Letter, ICI to DEC, response to DEC comments of 6/17/91 for Final Site Investigation Report of 4/91.
9/6/91	Report, ICI to DEC, submit Feasibility Study
10/25/91	Letter, DEC to ICI, comments on FS
10/30/91	Letter, DEC to ICI, comments on Supplementary Site Investigation Report (SSIR) of 8/91
10/31/91	Meeting, DEC/DOH/NCHD/ICI/CRA Re: Remedial Alternatives
11/5/91	Meeting, DEC/DOH/ICI/CRA, Feasibility Study
11/26/91	Letter, ICI to DEC, response to DEC 10/31/91 comments on (SSIR)
1/13/92	Report, ICI to DEC, Remediation Proposal
1/16/92	Letter, CRA to DEC, response to DEC comments of 10/25/91 on FS

2/18/92 Report, ICI to DEC, submit proposal "Description and Evaluation of Supplemental Remedial Alternatives.

Table 1

CHEMICAL ANALYSIS PARAMETERS

Chemical Species	Reason for Inclusion*	Seepage Collection Samples	Soil Samples	Ground Water Samples
antimony	W	Yes	Yes	Yes
arsenic	W	Yes	Yes	Yes
boron	W	Yes	Yes	Yes
iron (total)	X	Yes	Yes	Yes
lead	W	Yes	Yes	Yes
manganese	W	Yes	Yes	Yes
zirconium	W	Yes	Yes	Yes
calcium	G	Yes	Yes	Yes
magnesium	G	Yes	No	Yes
potassium	G	Yes	Yes	Yes
sodium	X	Yes	Yes	Yes
chloride	X	Yes	No	Yes
bicarbonate alkalinity	G	Yes	No	Yes
nitrate	G	Yes	Yes	Yes
sulfate	G	Yes	No	Yes
sulfide (total)	W	Yes	No	Yes
carbon disulfide	W	Yes	Yes	Yes
carbon tetrachloride	W	Yes	Yes	Yes

* G: Needed for determination of ground water characteristics
W: Prior plant operations may have generated this substance
X: Both G and W

7632B/0396B

Table 1
(Continued)

CHEMICAL ANALYSIS PARAMETERS

Chemical Species	Reason for Inclusion*	Seepage Collection Samples	Soil Samples	Ground Water Samples
chloroform	W	Yes	Yes	Yes
methylene chloride	W	Yes	Yes	Yes
tetrachloroethylene	W	Yes	Yes	Yes
parachlorothiophenol	W	Yes	No**	Yes
octochlorostyrene	W	No	No	Yes
polychlorinated biphenyls	W	Yes	Yes	Yes
total organic carbon (TOC)	W	Yes	No	Yes
total organic halogens (TOX)	W	Yes	No	Yes
pH	X	Yes	Yes	Yes
specific conductance	X	Yes	No	Yes
priority pollutants	W	No	No	Yes

* G: Needed for determination of ground water characteristics
W: Prior plant operations may have generated this substance
X: Both G and W

** Attempts at analysis for this substance in soils were not successful

Table 2

LABORATORY ANALYSES

A. SUMMARY OF LABORATORY ANALYTICAL METHODS

Parameter	Description	EPA Method
Volatile organics[(a)(b)]	Purge and trap preparation Headspace preparation Analysis by GC/MS	SW-846 method 5030 SW-846 method 5020 EPA 624
Extractable organics[(b)(c)]	Solvent extraction GC/MS	EPA 625
Pesticides[(b)]	Solvent extraction GC-ECD	EPA 608
Total organic carbon - TOC	Beckman TOC analyser	EPA 415.1
Total organic halogen - TOX	Dohrmann MCTS 20 Microcoulometer	EPA 450.1
Total suspended solids	Gravimetric	EPA 160.2
Alkalinity	Acid titration	EPA 403
Phenolics	4-Aminoantipyrine colorimetric	EPA 120.2
Cyanide	Chloramine-T colorimetric	EPA 335.3
Chloride Sulfate Nitrate	Dionex model 10 ion	EPA 300
Sulfide	Titrimetric	EPA 376.1
Cations and heavy metals[(b)(d)]	ARL inductively coupled argon plasma emission spectrometer	EPA 200.7

(a) Chloroform, carbon tetrachloride, tetrachloroethene, carbon disulfide chlorobenzene, methylene chloride
(b) Priority pollutants
(c) Parachlorothiophenol, bis (p-chlorophenyl) disulfide
(d) Antimony, arsenic, boron, calcium, iron, lead, magnesium, manganese, potassium, sodium, zirconium

B. FIELD ANALYSES

pH	EPA 150.1
Specific conductance	EPA 120.1

AR:5960d

TABLE 3

SITE-SPECIFIC PARAMETER LIST (SSPL)

Carbon Disulfide
Carbon Tetrachloride
Chloroform
Methylene Chloride
Tetrachloroethylene
Trichloroethylene
Benzene
Toluene

TABLE 4

SUMMARY OF ON-SITE SOIL ANALYTICAL RESULTS
TCL (1) COMPOUNDS

Compound	*BH13* *4' - 5.5'*	*BH22* *3.5' - 5'*	*BH28A* *5' - 7'*	*BH29* *3.5' - 5'*
Volatile Organics (ppb)				
Tetrachloroethene	<5	<5	4J	<5
Trichloroethene	<5	<5	2J	<5
Acetone	110	70	<50	50
BNA (ppb)				
Diethyl phthalate	<660	200JB	<1,000	100JB
2,4,5-Trichlorophenol	100J	100J	100J	100J
Bis(2-ethylhexyl)phthalate	<660	400J	700J	1,400
Benzo(b)fluoranthene	<660	<660	300J	<660
Benzo(k)fluoranthene	<660	<660	300J	<660
Chrysene	<660	<660	400J	<660
Dibenzofuran	<660	<660	300J	<660
Di-n-butyl phthalate	<660	<660	200J	200JB
Fluoranthene	<660	<660	300J	<660
2-Methylnaphthalene	<660	<660	1,000J	<660
Naphthalene	<660	<660	1,000J	<660
Phenanthrene	<660	<660	700J	<660
Pyrene	<660	<660	400J	<660

Notes:

(1) TCL - Target Compound List
J - Detected, but below quantitation limit; quantitation suspect.
B - Compound detected in method blank associated with this sample.

TABLE 5

SUMMARY OF ON-SITE SOIL ANALYTICAL RESULTS
SSPL (1) VOLATILE ORGANIC COMPOUNDS - ppb

Location:	*BH1*		*BH2*	*BH3*	*BH4*	*BH5*	*BH6*		*BH7*
Depth:	*4' - 6'*	*10' - 12'*	*4' - 6'*	*2' - 4'*	*1' - 3'*	*2' - 4'*	*2' - 4'*	*8' - 10'*	*8' - 10'*
Parameter (ppb)									
Carbon Disulfide	<5	<5	<5	<5	<5	<620	<620	<620	<5
Carbon Tetrachloride	<5	<5	<5	<5	<5	**280J**	**7,000**	**360J**	<5
Chloroform	<5	<5	<5	<5	<5	**460J**	**2,100**	<620	<5
Methylene Chloride	<5	<5	<5	<5	<5	<620	<620	<620	<5
Trichloroethene	<5	<5	<5	<5	<5	**5,800**	<620	<620	<5
Benzene	<5	<5	<5	<5	<5	<620	<620	<620	<5
Toluene	<5	<5	<5	<5	<5	<620	<620	<620	<5
Tetrachloroethene	<5	<5	<5	<5	<5	**7,100**	<620	**1,200**	<5

Location:	*BH8*		*BH9*		*BH10*	*BH11*	*BH12*	*BH13*	*BH14*	*BH15*
Depth:	*6' - 8'*	*12' - 12.8'*	*8' - 10'*	*14' - 15'*	*6' - 8'*	*4' - 6'*	*8' - 9.2'*	*5.5' - 7.0'*	*7' - 9'*	*2.5' - 4.5'*
Parameter (ppb)										
Carbon Disulfide	<1,200	<1,200	<1200	<50	<5	<5	<5	<5	<5/<5	<5
Carbon Tetrachloride	**37,000**	**32,000**	**23,000**	**1,200**	<5	<5	<5	<5	<5/<5	<5
Chloroform	**500J**	**2,000**	**3,000**	**330**	<5	<5	<5	<5	<5/<5	<5
Methylene Chloride	<1,200	<1,200	<1,200	**<180B**	<5	<5	<5	<5	<5/<5	<5
Trichloroethene	<1,200	<1,200	**2000**	**170**	<5	<5	<5	<5	<5/<5	<5
Benzene	<1,200	<1,200	<1,200	**24J**	<5	<5	<5	<5	<5/<5	<5
Toluene	<1,200	<1,200	<1,200	<50	<5	<5	<5	<5	<5/<5	<5
Tetrachloroethene	<1,200	<1,200	<1,200	**60**	<5	<5	**4J**	<5	<5/<5	<5

Notes:

(1) SSPL - Site Specific Parameter List.
J - Detected, but below quantitation limit, quantitation suspect.
B - Compound detected in method blank associated with this sample.
S - Estimated due to outlying surrogate recoveries.

TABLE 5 CONT.

SUMMARY OF ON-SITE SOIL ANALYTICAL RESULTS
SSPL (1) VOLATILE ORGANIC COMPOUNDS - ppb

Location:	BH16	BH17	BH18	BH19	BH20		BH21	BH23	BH24	
Depth:	4' - 6'	5' - 7'	7' - 8.6'	4' - 5.7'	5' - 7'	7' - 7.3'	4' - 6'	4' - 6'	4' - 6'	6' - 8'
Parameter (ppb)										
Carbon Disulfide	<5	<5	<5/<5	<5	<5	7	<5	<5	<5	<5
Carbon Tetrachloride	<5	<5	<5/<5	<5	100	52	<5	<5	<5	<5
Chloroform	<5	<5	<5/<5	<5	19	9	<5	<5	<5	<5
Methylene Chloride	<5	<5	<5/<5	<5	<5	<5	<5	<5	<5	<5
Trichloroethene	<5	<5	<5/<5	<5	<5	<5	<5	<5	<5	<5
Benzene	<5	<5	<5/<5	<5	<5	<5	<5	<5	<5	<5
Toluene	<5	<5	<5/<5	<5	<5	<5	<5	<5	<5	<5
Tetrachloroethene	<5	<5	<5/<5	<5	17	20	<5	3J	<5	<5

Location:	BH25	BH26	BH27		BH27A
Depth:	1.7' - 2.4'	6' - 8'	0' - 2'	4' - 5.2'	8' - 10'
Parameter (ppb)					
Carbon Disulfide	<5	<5	<630	<610	<5/<5
Carbon Tetrachloride	<5	<5	<630	<610	<5/<5
Chloroform	<5	<5	<630	<610	<5/<5
Methylene Chloride	<5	<5	<630	<610	<5/<5
Trichloroethene	<5	<5	<630	<610	<5/<5
Benzene	<5	<5	<630	<610	<5/<5
Toluene	<5	<5	930	<610	<5/<5
Tetrachloroethene	<5	<5	550J	13,000	<5/<5

Notes:

(1) SSPL - Site Specific Parameter List.
J - Detected, but below quantitation limit, quantitation suspect.

TABLE 6

SUMMARY OF ORGANIC COMPOUND
ANALTYTICAL RESULTS - FORMER LANDFILLS

Borehole Location:	*BH30*		*BH31*		*BH32*		*BH33*	
Depth:	*10' - 12'*	*16'-18'*	*4' - 6'*	*12'-14'*	*6- '8'*	*8' - 10'*	*8' - 10'*	*14' - 15.4'*
Sample Designation:					*2365-98*	*2365-98N*	*BH-33-2365-AK-003*	*BH-33-2365-AK-001*
Sample Date:					*11/15/89*	*11/15/89*	*3/5/91*	*3/5/91*
Volatile Organics (ppb)								
Acetone	<40,000	--	4,000/18,000	--	--	--	--	--
1,2-Dichloroethene (total)	4,000	--	<500/<1,000	--	--	--	--	--
Ethylbenzene	3,000J	--	<500/<1,000	--	--	--	--	--
Total Xylenes	19,000	--	<500/<1,000	--	--	--	--	--
Carbon Disulfide	<4,000	<13	12,000/34,000	<5S/<5	<5	<5	<5	6
Carbon Tetrachloride	<4,000	<13	3,000/3,000	<5S/2J	<5	<5	<5	18
Chloroform	<4,000	<13	<500/2,000	6S/3J	<5	<5	<5	21
Methylene Chloride	10,000	<13	<500/<1,000	8SB/<5	<5	<5	<5	<5
Trichloroethene	4,000	<13	<500/<1,000	<5S/<5	<5	<5	<5	<5
Benzene	--	<13	--	<5S/<5	<5	<5	<5	<5
Toluene	--	<13	--	<5S/<5	<5	<5	<5	<5
Tetrachloroethene	130,000	190	<500/<1,000	<5S/<5	<5	<5	3J	3J
BNA (ppb)								
Phenanthrene	<8,300	--	<6,700/100J	--	--		--	
Hexachlorobutadiene	1,000J	--	<6,700/<660	--	--	--	--	
Hexachloroethane	16000	--	<6,700/<660	--	--	--	--	
Phenol	<8300	--	<6,700/1,300	--	--	--	--	

Borehole Location:	*BH37*		*BH38*		*BH39*	
Depth:	*6' - 8'*	*14' - 15.9'*	*2' - 4'*	*14' - 15.4'*	*4' - 6'*	*14' - 15.4'*
Sample Designation:	*BH37-2365-AK-011*	*BH37-2365-AK-012*	*BH38-2365-AK-013*	*BH-2365-AK-014/015*	*BH-2365-AK-016*	*BH-2365-AK-017*
Sample Date:	*3/6/91*	*3/6/91*	*3/7/91*	*3/7/91*	*3/7/91*	*3/7/91*
Volatile Organics (ppb)						
Acetone	--	--	--	--	--	--
1,2-Dichloroethene (total)	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--
Total Xylenes	--	--	--	--	--	--
Carbon Disulfide	<5	<5	<5	<5/<5	<5	<5
Carbon Tetrachloride	<5	<5	<5	<5/<5	<5	<5
Chloroform	<5	<5	<5	<5/<5	<5	<5
Methylene Chloride	<5	<5	<5	<5/<5	<5	<5
Trichloroethene	<5	<5	<5	<5/<5	<5	15
Benzene	<5	<5	10	<5/<5	5	<5
Toluene	<5	<5	<5	<5/<5	<5	<5
Tetrachloroethene	<5	<5	<5	<5/<5	26	130

Borehole Location:	*BH34*		*BH35*		*BH36*	
Depth:	*12' - 14'*	*14' - 16'*	*6' - 7'*	*14' - 14.9'*	*6' - 8'*	*12' - 14'*
Sample Designation:	*BH34-2365-AK-004*	*BH34-2365-AK-005*	*BH35-2365-AK-006*	*BH35-2365-AK-007/008*	*BH36-2365-AK-009*	*BH36-2365-AK-101*
Sample Date:	*3/5/91*	*3/5/91*	*3/6/91*	*3/6/91*	*3/6/91*	*3/6/91*
Volatile Organics (ppb)						
Acetone	--	--	--	--	--	--
1,2-Dichloroethene (total)	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--
Total Xylenes	--	--	--	--	--	--
Carbon Disulfide	56S	21J	<5	<5/<5	230	<5
Carbon Tetrachloride	<50S	<25	<5	<5/<5	230	<5
Chloroform	320S	<25	<5	<5/<5	57	<5
Methylene Chloride	<50S	<25	<5	<5/<5	<5	<5
Trichloroethene	<50S	39	<5	<5/<5	<5	<5
Benzene	<50S	15J	<5	<5/<5	<5	<5
Toluene	<50S	12J	<5	<5/<5	3J	<5
Tetrachloroethene	<50S	19J	<5	<5/<5	19	<5
BNA (ppb)						
Phenanthrene						
Hexachlorobutadiene						
Hexachloroethane						
Phenol						

Notes:

J - Detected, but below quantitation limit; quantitation suspect.
B - Compound detected in method blank associated with this sample.
S - the associated value is estimated due to outlying surrogate recoveries.

TABLE 7

SUMMARY OF TAL ANALTYICAL RESULTS - FORMER LANDFILLS

Metals (ppm)	*BH30* *10' - 12'*	*BH31* *4' - 6'*
Silver	1.2	23/14
Aluminum	1,600	7,700/2,900
Arsenic	8.1	7/12
Barium	57	52/97
Beryllium	<.25	<.25/<.25
Calcium	7,300	48,000/79,000
Cadmium	<.5	<.5/<.5
Cobalt	2.8	6.8/3.5
Chromium	33	24/8.8
Copper	79	36/13
Iron	24,000	22,000/12,000
Mercury	.41	.48/.41
Potassium	240	1,200/530
Magnesium	1,700	25,000/44,000
Manganese	93	320/190
Sodium	130	950/480
Nickel	22	49/27
Lead	160	62/30
Antimony	2,000	30/74
Selenium	<.5	<.5/<.5
Thallium	<5	<5/<5
Vanadium	6.4	24/13
Zinc	19	110/47
Cyanide	<.1	<.1/<.1

Notes:

(1) TAL - Target Analyte List

TABLE 8

HYDROGEOLOGIC FLOW CHARACTERISTICS

Hydrogeolgical Unit	*Groundwater Flow Zone*	*General Flow Direction*	*Hydraulic Conductivity (cm/s)*	*Gradient*	*Unit Thickness (ft)*	*Perpendicular Length (ft)*	*Flow Rate (gal/min)*
Lockport Formation UWBZ	1	South	2.4×10^{-3}	0.02	10.5	850	6.4
	2	Southwest	1.8×10^{-5}	0.05	14.5	700	0.1
	3	West	9.5×10^{-5}	0.03	14.5	650	0.4
Lockport Formation LWBZ	1	South	9.3×10^{-4}	0.007	11	800	0.8
	2	Southwest	9.3×10^{-4}	0.02	13	950	3.4
Lockport/Rochester WBZ	1	South	7.5×10^{-5}	0.004	16.5	1450	0.1
	2	Southwest	5.9×10^{-4}	0.01	17	950	1.4
Rochester WBZ	1	South	2.0×10^{-7}	0.08	21.5	1650	0.008
	2	Southwest	2.7×10^{-5}	0.08	18	850	0.5

TABLE 9

SEEP SAMPLING RESULTS
SSPL (1) VOLATILE ORGANIC COMPOUNDS

	Forebay Seeps					*Gorge Seeps*									
Parameter (ppb)	***F1***	***F2***	***F3***	***F4***	***F5***	***G1***	***G2***	***G5***	***G6***	***G7***	***G8***	***G9***	***G10***	***G11***	***Field Blank***
Carbon Disulfide	<5	<5	<5	<5	<5	7	<5/<5	<5	3J	<5	<5	<5	<5	<5	<5
Carbon Tetrachloride	<5	<5	<5	<5	<5	190	3J/5	<5	<5	3J	<5	<5	<5	<5	<5
Chloroform	<5	<5	<5	<5	5	150	61/60	<5	<5	<5	<5	<5	<5	<5	<5
Methylene Chloride	<5	<5	<5	<5	<5	9	<5/<5	<5	<5	<5	<5	<5	<5	<5	<5
Trichloroethene	<5	<5	<5	27	<5	<5	<5/<5	<5	<5	<5	<5	<5	<5	<5	<5
Benzene	<5	<5	<5	<5	<5	<5	<5/<5	<5	<5	<5	<5	<5	<5	<5	<5
Toluene	<5	<5	<5	<5	<5	<5	<5/<5	<5	<5	<5	<5	<5	<5	<5	<5
Tetrachloroethene	<5	<5	<5	<5	<5	2J	<5/<5	<5	<5	<5	<5	<5	<5	<5	<5

Notes:

(1) SSPL - Site-Specific Parameter List
J - Detected, but below quantitation limit; quantitation suspect.

TABLE 10

GROUNDWATER AND SURFACE WATER STANDARDS
AND CRITERIA FOR SITE-SPECIFIC PARAMETERS

	Potential SCGs	
	Most Stringent MCL(1) *(μg/L)*	
Parameter	*Class GA Groundwater*	*Class AA Surface Water*
Benzene	Not Detectable (2)	0.7
Carbon Disulfide	50	5
Carbon Tetrachloride	5	0.4
Chloroform	100	0.2
Methylene Chloride	5	5
Tetrachloroethene	5	0.7
Toluene	5	5
Trichloroethene	5	3

Notes:

(1) The MCL for each parameter is the most stringent of the following sources:
  (a) 40 CFR 141 - Title 40, Codes of Federal Regulations Chapter 141 - "Primary Drinking Water Standards" - as amended in 55 FR 25064, June 19, 1990.
  (b) Sanitary Code Part 5 - Chapter I, - State Sanitary Code - Part 4 - "Drinking Water Supplies", November 28, 1988.
  (c) 6 NYCRR Part 703.5 - New York State Codes, Rules and Regulations, Title 6, Chapter 10, Part 703.5, March 31, 1986.
  (d) 10 NYCRR Part 170 - New York State Codes, Rules and Regulations, Title 10, Chapter 3, Subchapter C, Part 170 - "Water Supplies Sources", August 1971.

(2) Not Detectable means by tests or analytical determinations referenced in 6 NYCRR Part 703.4.

TABLE 11

NEW YORK STATE AMBIENT AIR GUIDELINE CONCENTRATIONS
FOR SITE-SPECIFIC PARAMETERS (1)

Parameter	*Occupational Value (2) (μg/m3)*	*Proposed AGC (3) (μg/m3)*	*AGC (3) (μg/m3)*
Benzene	30,000 (T, Haz2) (4)	0.12 (U)	100 (T, Haz)
Carbon Disulfide	12,000 (P)	7.0 (DEC)	100 (T)
Carbon Tetrachloride	30,000 (T, Haz2)	0.07 (U)	100 (T)
Chloroform	9,780 (P)	23.3 (P)	167 (T)
Methylene Chloride	175,000 (T, Haz2)	27.0 (DEC)	1,167 (T)
Tetrachloroethene	170,000 (P)	1.2 (DEC)	1,116 (T)
Toluene	375,000 (T)	2,000 (T)	7,500 (T)
Trichloroethene	270,000 (T)	0.45 (DEC)	900 (T)

Notes:

(1) New York State Air Guide-1, Division of Air Resources, NYSDEC, September 1989.

(2) Occupational Values:
- (T) - 1989 ACGIH TWA-TLV
- (P) - 1989 OSHA final rule limit TWA-PEL

(3) AGC (Ambient Guideline Concentration) source:
- (T) - AGC derived from ACGIH TWA-TLV
- (DEC) - Contaminant-specific AGC determined by NYSDEC, Division of Air Resources, Bureau of Air Toxics, Toxics Assessment Section
- (P) - AGC based on OSHA final rule limit TWA-PEL
- (U) - Contaminant-specific AGC based on 1x10-6 risk applied to Unit Risk Factor developed by the USEPA Carcinogen Assessment Group (CAG)

(4) (Haz) - Human carcinogens:
Haz1 - Confirmed Human Carcinogen
Haz2 - Suspected Human Carcinogen

TABLE 12

POTENTIAL ACTION-SPECIFIC SCGs

Activity	FEDERAL SCGs *Title*	*Subtitle*	*Citation*	NEW YORK STATE SCGs *Title*	*Subtitle*	*Citation*
Capping	Standards for owners and operators of hazardous waste treatment, storage and disposal facilities	Closure and post-closure care Post-closure care and use of property	40 CFR 264.310 40 CFR 264.117(c)	Hazardous waste treatment, storage and disposal facility permitting requirements	--	6 NYCRR Subpart 373-1
				Final status standards for owners and operators of hazardous waste treatment, storage and disposal facilities	--	6 NYCRR Subpart 373-2
Container Storage	Standards for owners and operators of hazardous waste treatment, storage and disposal facilities	Condition of containers Compatibility of waste with containers Management of containers Inspections Containment	40 CFR 264.171 40 CFR 264.172 40 CFR 264.173 40 CFR 264.174 40 CFR 264.175	Hazardous waste treatment, storage and disposal facility permitting requirements	--	6 NYCRR Subpart 373-1
Constuction of New Landfill on Site	Standards for owners and operators of hazardous waste treatment, storage and disposal facilities	Design and operating requirements Operation and maintenance Closure and post-closure care Groundwater protection	40 CFR 264.301 40 CFR 264.303-304 40 CFR 264.310 40 CFR 264.91-100	Hazardous waste treatment, storage and disposal facility permitting requirements	--	6 NYCRR
Discharge of Treatment System Effluent	Administered permit programs: The national pollutant discharge elimination system	Establishing limitations, standards and other permit conditions	40 CFR 122.44 and State regulations approved under 40 CFR 131	Implementation of NPDES program in New York State Technical and Operations Guidance Series Blending policy for use of sources of drinking water Drinking water supplies Use and protection of waters	-- -- -- -- --	6 NYCRR Part 750-757 -- NYSDOH PWS 68 Part 5 of State Sanitary Code 6 NYCRR Part 608
	Criteria and standards for the national pollutant discharge elimination program	Best management practices Discharge to waters of the U.S.	40 CFR 125.100 40 CFR 125.104			
	Guidelines establishing test procedures for the analysis of pollutants	Identification of test procedures and alternate test procedures	40 CFR 136.1-4			
	Effluent guidelines and standards	Organic chemicals plastics and synthetic fibres	40 CFR Part 414			
Excavation	Land disposal restrictions (also see Closure)	Treatment standards	40 CFR 268 (Subpart D)	Hazardous waste treatment, storage and disposal facility permitting requirements	--	6 NYCRR Subpart 373-1
Incineration Off Site	Standards for owners and operators of hazardous waste treatment, storage and disposal facilities	Waste analysis	40 CFR 264.341			
Land Treatment	Standards for owners and operators of hazardous waste treatment, storage and disposal facilities	Treatment program Design and operating requirements Unsaturated zone monitoring Special requirements for ignitable or reactive waste	40 CFR 264.271 40 CFR 264.273 40 CFR 264.278 40 CFR 264.281	Hazardous waste treatment, storage and disposal facility permitting requirements	--	6 NYCRR Subpart 373-1
				New York air pollution control regulations	General provisions Permits and certificates General prohibitions General process emission sources	6 NYCRR Part 200 6 NYCRR Part 201 6 NYCRR Part 211 6 NYCRR Part 212
Placement of Waste in Land Disposal Unit	Land disposal restrictions	Treatment standards	40 CFR 268 (Subpart D)	Hazardous waste treatment, storage and disposal facility permitting requirements	--	6 NYCRR Subpart 373-1

TABLE 12 CONT.

POTENTIAL ACTION-SPECIFIC SCGs

Activity	FEDERAL SCGs Title	Subtitle	Citation	NEW YORK STATE SCGs Title	Subtitle	Citation
Surface Water Control	Standards for owners and operators of hazardous waste treatment, storage and disposal facilities	Design and operating requirements for waste piles	40 CFR 264.251(c),(d)	Hazardous waste treatment, storage and disposal facility permitting requirements	--	6 NYCRR Subpart 373-1 6 NYCRR Part 701 and Part 703
		Design and operating requirements for land treatment	40 CFR 264.273(c),(d)			
		Design and operating requirements for landfills	40 CFR 264.301(c),(d)			
Treatment (in a unit)	Standards for owners and operators of hazardous waste treatment, storage and disposal facilities	Design and operating requirements for waste piles	40 CFR 264.251	Hazardous waste treatment, storage and disposal facility permitting requirements	--	6 NYCRR Subpart 373-1
		Design and operating requirements for thermal treatment units	40 CFR 265.373	Interim status standards for owners and operators of hazardous waste facilities	--	6 NYCRR Subpart 373-3
		Design and operating requirements for miscellaneous treatment units	40 CFR 264.601	New York air pollution control regulations	General provisions Permits and certificates General prohibitions General process emission sources	6 NYCRR Part 200 6 NYCRR Part 201 6 NYCRR Part 211 6 NYCRR Part 212
Treatment (when waste will be land disposed)	Land disposal restrictions	Identification of waste	40 CFR 268.10-12	Hazardous waste treatment, storage and disposal facility permitting requirements	--	6 NYCRR Subpart 373-1
		Treatment Standards Waste	40 CFR 268 (Subpart D)			
		Specific prohibitions - Solvent wastes	40 CFR 268.30 RCRA Sections 3004 (d) (3), (e) (3) 42 USC 6924 (d) (3), (e) (3)	Interim status standards for owners and operators of hazardous waste facilities	--	6 NYCRR Subpart 373-3
Waste Pile	Standards for owners and operators of hazardous waste treatment, storage and disposal facilities	Design and operating requirements	40 CFR 264.251	New York air pollution control regulations	General provisions Permits and certificates General prohibitions General process emission sources	6 NYCRR Part 200 6 NYCRR Part 201 6 NYCRR Part 211 6 NYCRR Part 212
				Hazardous waste treatment, storage and disposal facility permitting requirements	--	6 NYCRR Subpart 373-1
				Interim status standards for owners and operators of hazardous waste facilities	--	6 NYCRR Subpart 373-3
Closure with Waste in Place	Standards for owners and operators of hazardous waste treatment, storage and disposal facilities	Closure and post-closure care	40 CFR 264.258			
		Post-closure care and groundwater monitoring	40 CFR 264.310			
Closure of Land Treatment Units	Standards for owners and operators of hazardous waste treatment, storage and disposal facilities	Closure of land treatment units	40 CFR 264.280	Final status standards for owners and operators of hazardous waste facilities	--	6 NYCRR Subpart 373-2
Transporting Hazardous Waste Off Site	Standards applicable to transporters of hazardous waste	--	40 CFR 263	Waste transport permits	--	5 NYCRR Part 364
				Hazardous waste manifest system and related standards for generators, transporters and facilities	--	6 NYCRR Part 372

TABLE 13

IDENTIFICATION OF POTENTIAL GENERAL RESPONSE ACTIONS AND REMEDIAL TECHNOLOGIES

	General Response Actions		*Remedial Technologies*		*Process Options*
1.	No - Action		–		–
2.	Limited Action	a)	Institutional Controls	i)	Restricted future land/ groundwater use
3.	Physical Containment Action	a)	Capping Entire Site	i) ii)	Non-RCRA Cap RCRA Cap
		b)	Partial Capping	i) ii)	Non-RCRA Cap RCRA Cap
		c)	Surface Water Drainage Control		–
		d)	Fixation/Stabilization in Place		–
		e)	Barrier Wall/ Grout Contain		–
4.	Hydraulic Containment Action	a)	Extraction Wells		–
5.	In situ Treatment Action (Soils)	a)	Biological	i)	Biological
		b)	Physical	i)	Vacuum extraction
6.	Removal/Treatment Action (Soils)	a)	On-Site Physical	i) ii) iii) iv)	Landfarming Vacuum Extraction Low Temperature Thermal Mobile Incineration
		b)	On-Site Chemical	i)	Solvent Extraction
		c)	On-Site Biological	i)	Biological
		d)	Off-Site Physical	i)	Incineration
7.	In situ Treatment Action (Groundwater)	a)	Biological	i)	Biological
8.	Removal/Treatment Action (Water)	a)	On-Site Physical	i) ii) iii) iv)	Carbon Adsorption Air Stripping Aeration Mobile Incineration
		b)	On-SiteChemical	i)	UV Oxidation
		c)	On-Site Biological	i)	Biological
		d)	Off-Site	i)	–
9.	Disposal Action (Soils)	a)	Off-Site Disposal	i)	Landfill
		b)	On-Site Disposal	i)	Landfill

TABLE 13 CONT.

IDENTIFICATION OF POTENTIAL
GENERAL RESPONSE ACTIONS AND
REMEDIAL TECHNOLOGIES

General Response Actions	*Remedial Technologies*	*Process Options*
10. Disposal Action (Water)	a) Off-Site Disposal	i) Transport to Treatment Plant ii) Discharge to POTW
	b) On-Site Disposal	i) Discharge to Groundwater ii) Discharge to Surface Water
11. Treatment Action (NAPL)	a) On-Site Physical	i) Incineration
	b) Off-Site Physical	i) Incineration

TABLE 14

Site-Specific Parameter List (SSPL)
DEC-Soil Cleanup Levels (ppm)

Carbon Disulfide	*
Carbon Tetrachloride	0.5
Chloroform	0.2
Methylene Chloride	1.0
Tetrachloroethylene	1.5
Trichloroethylene	0.5
Benzene	0.5
Toluene	1.5

* No numerical value set.
Odors should remain below nuisance level.

TABLE 15

STAUFFER PLANT SITE #932053

Cost Estimates for the Selected Remedial Alternative

Operable Unit	Selected Alernative	Total Estimated Cost (Present Worth)	Estimated Capital Costs	O&M Costs as Present Worth	Estimated Annual O&M Costs
Surfsurface Soils Site & Disposal Areas	IVES	2,876,000	1,300,000	1,576,000	102,000
Surface Water Drainage Control	Surface Water Drainage	508,000	500,000	7,700	500
Groundwater Extraction & Treatment	Extraction Wells	3,481,000	96,000	3,385,000	220,000
DNAPL Extraction Off-Site Incineration	Extraction	138,000	8,000	130,000	8,400
TOTAL		7,003,000	1,904,000	5,098,700	432,900

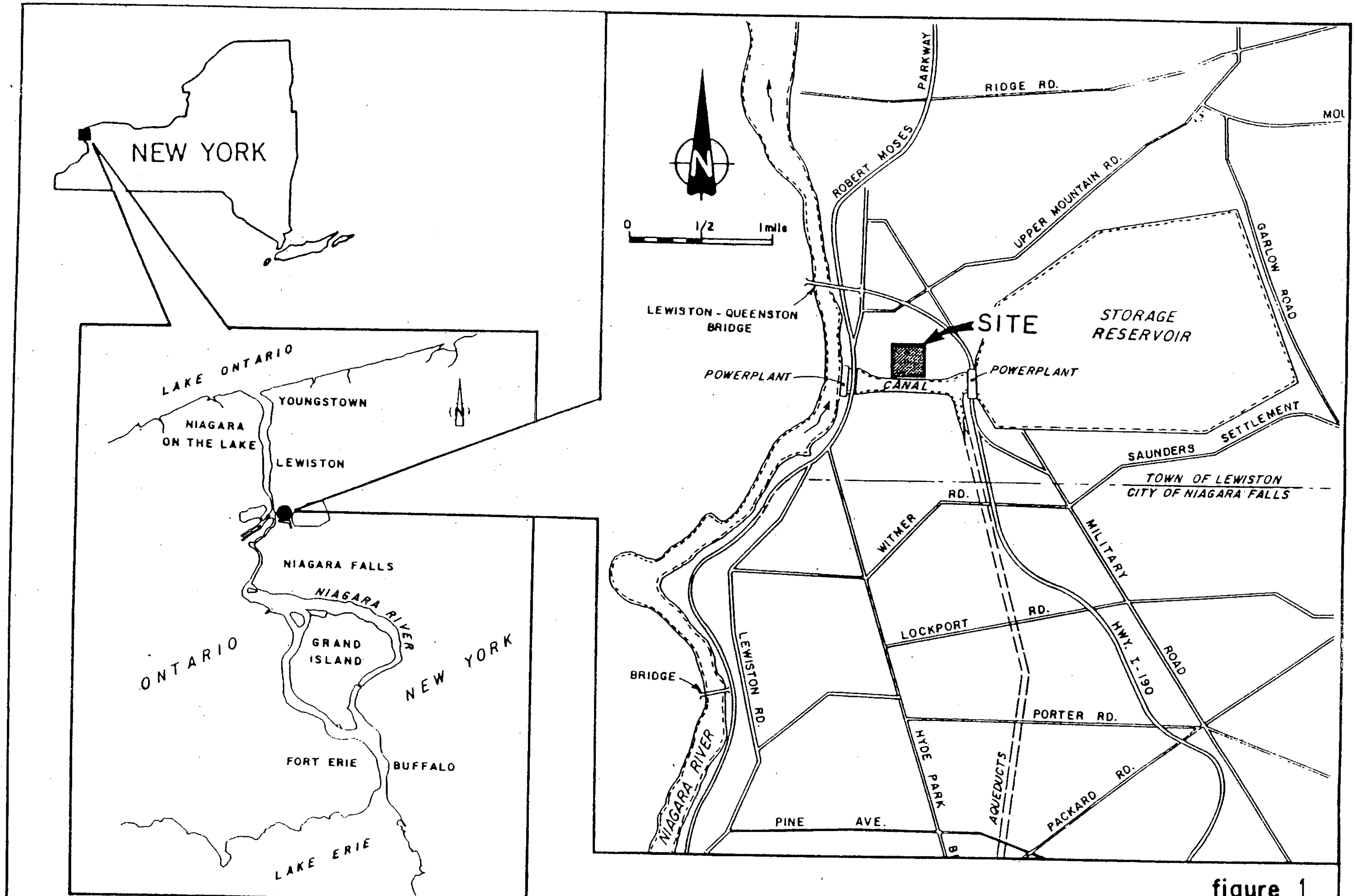


figure 1
LOCATION PLAN
Stauffer Management Co.

2365–20/04/90–8–0

SMC-789 0922

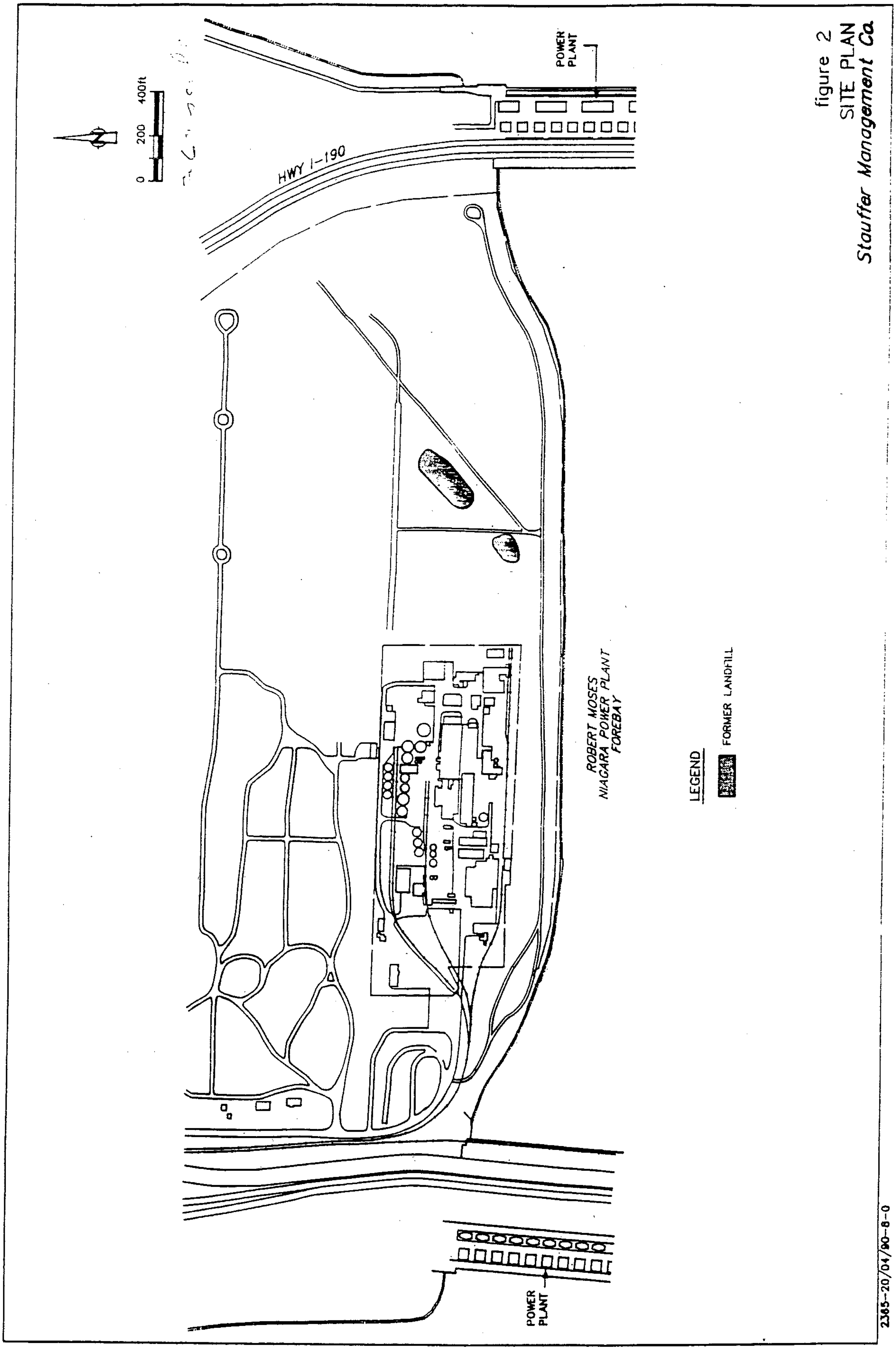


figure 2
SITE PLAN
Stauffer Management Co.

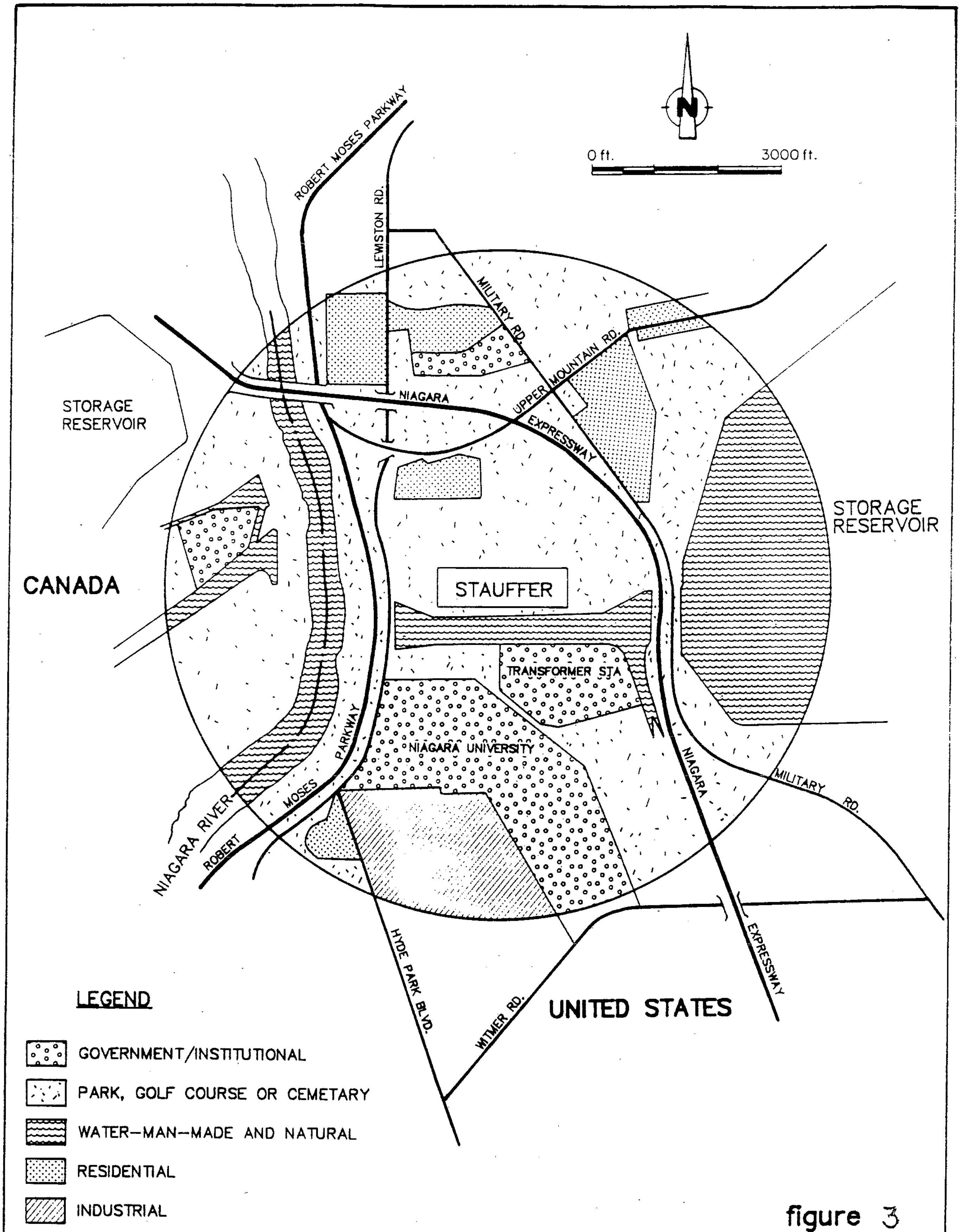


figure 3

SITE DEMOGRAPHY–1 MILE RADIUS

Stauffer Management Co.

2365–18/05/90–8–0

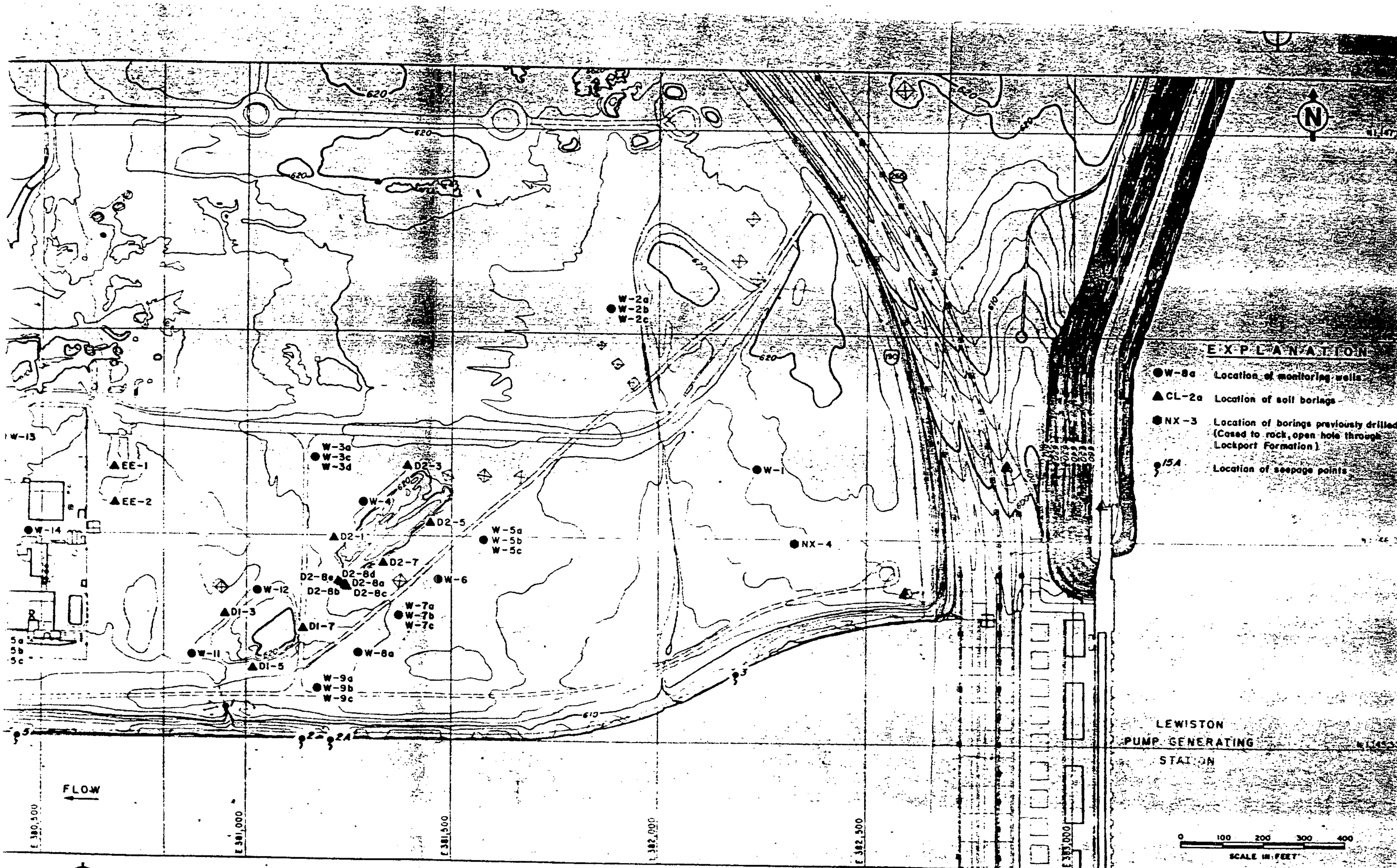


Figure 4 LOCATION PLAN: MONITORING WELLS SOIL BORINGS, SEEPAGE POINTS

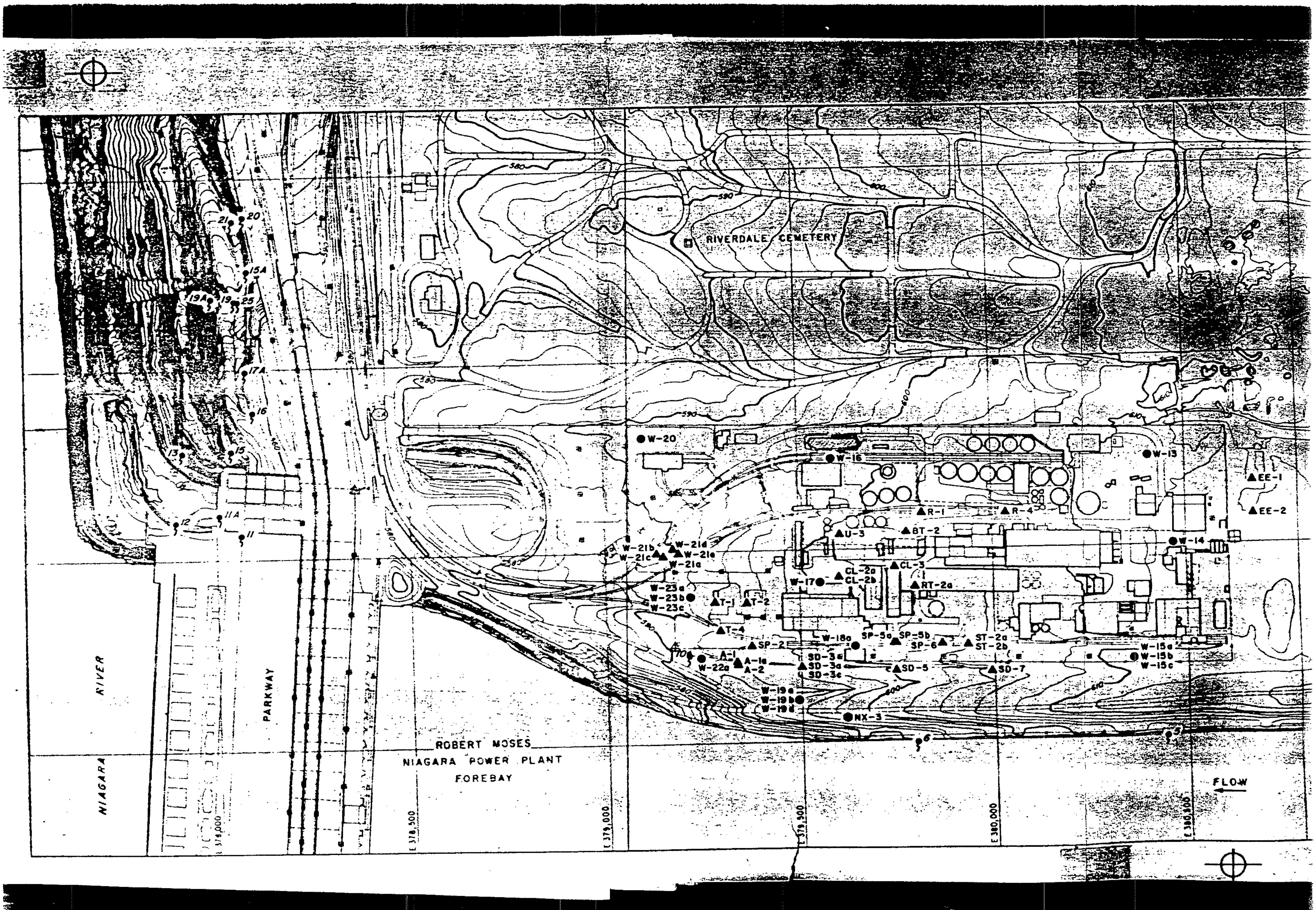


FIGURE 4 CONT.

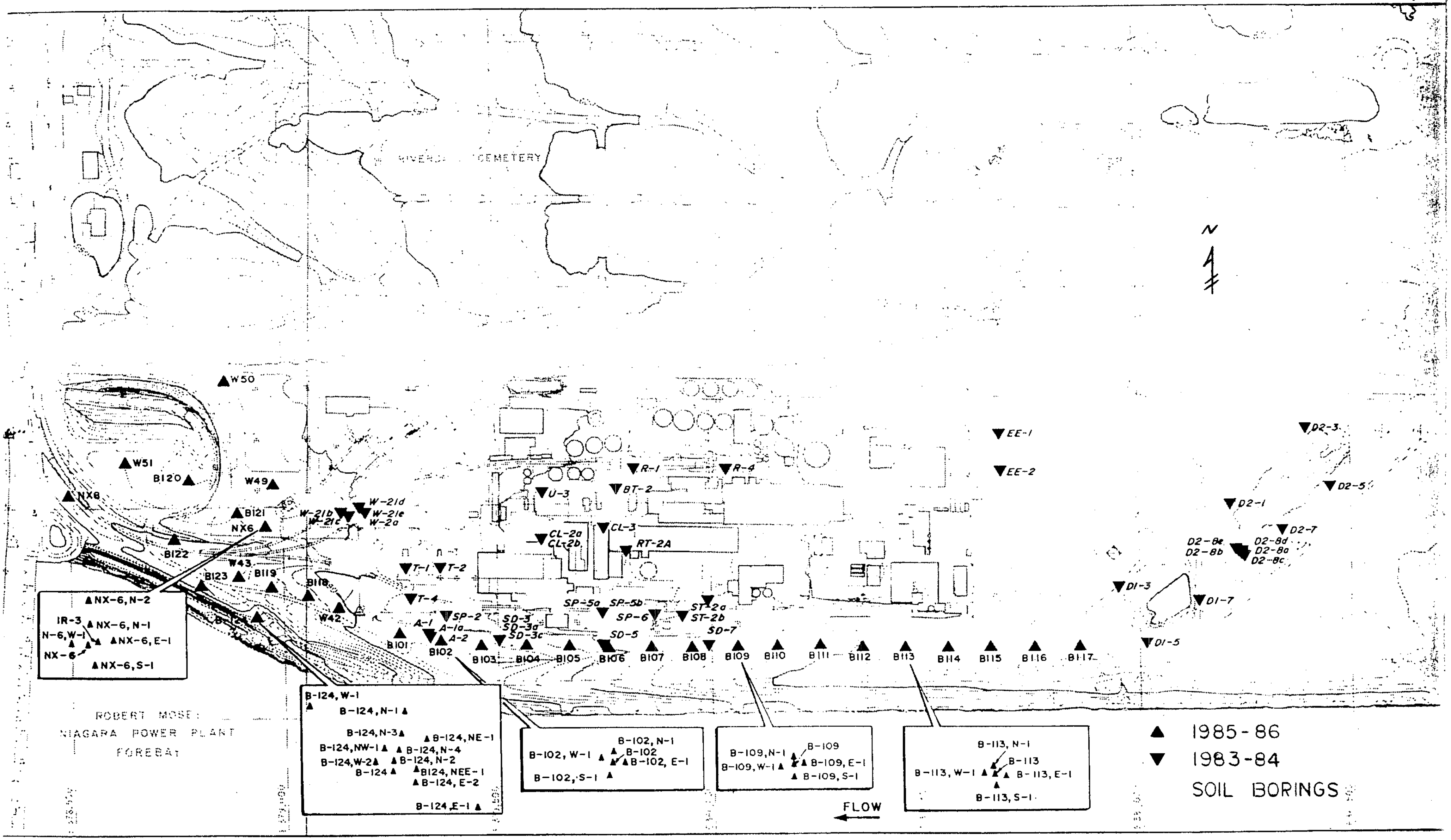


FIGURE 5

SMC-789 0927

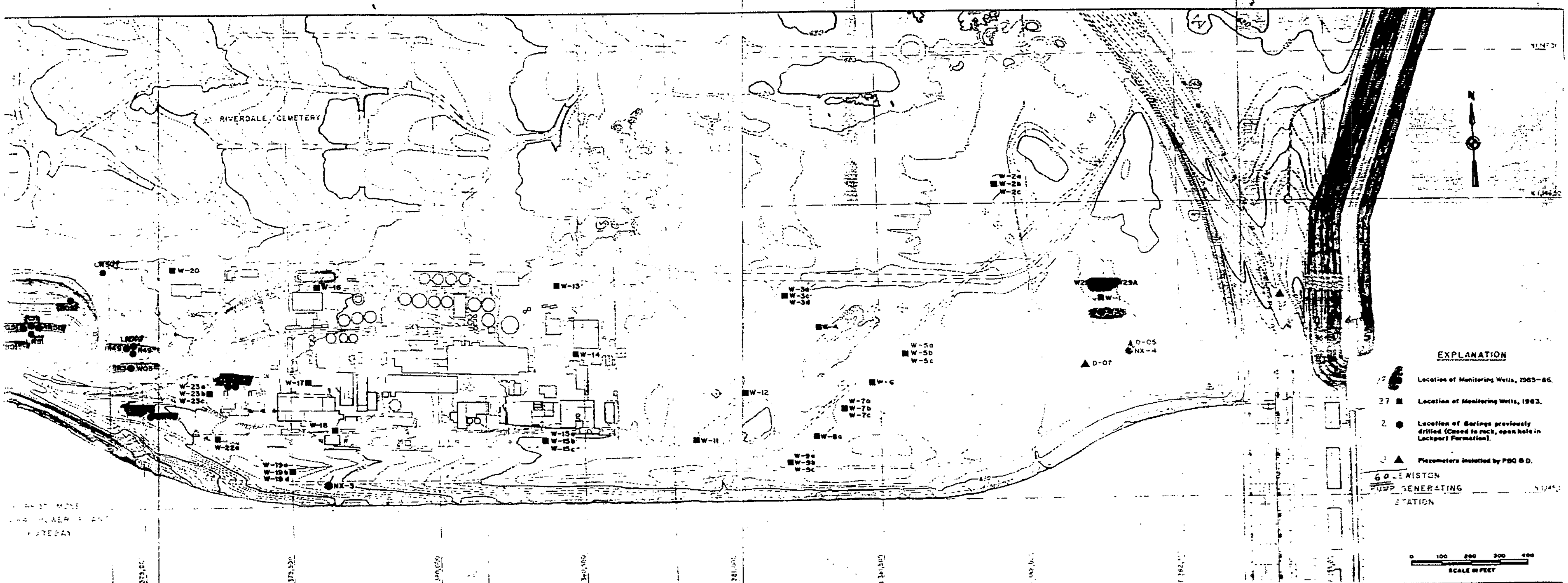
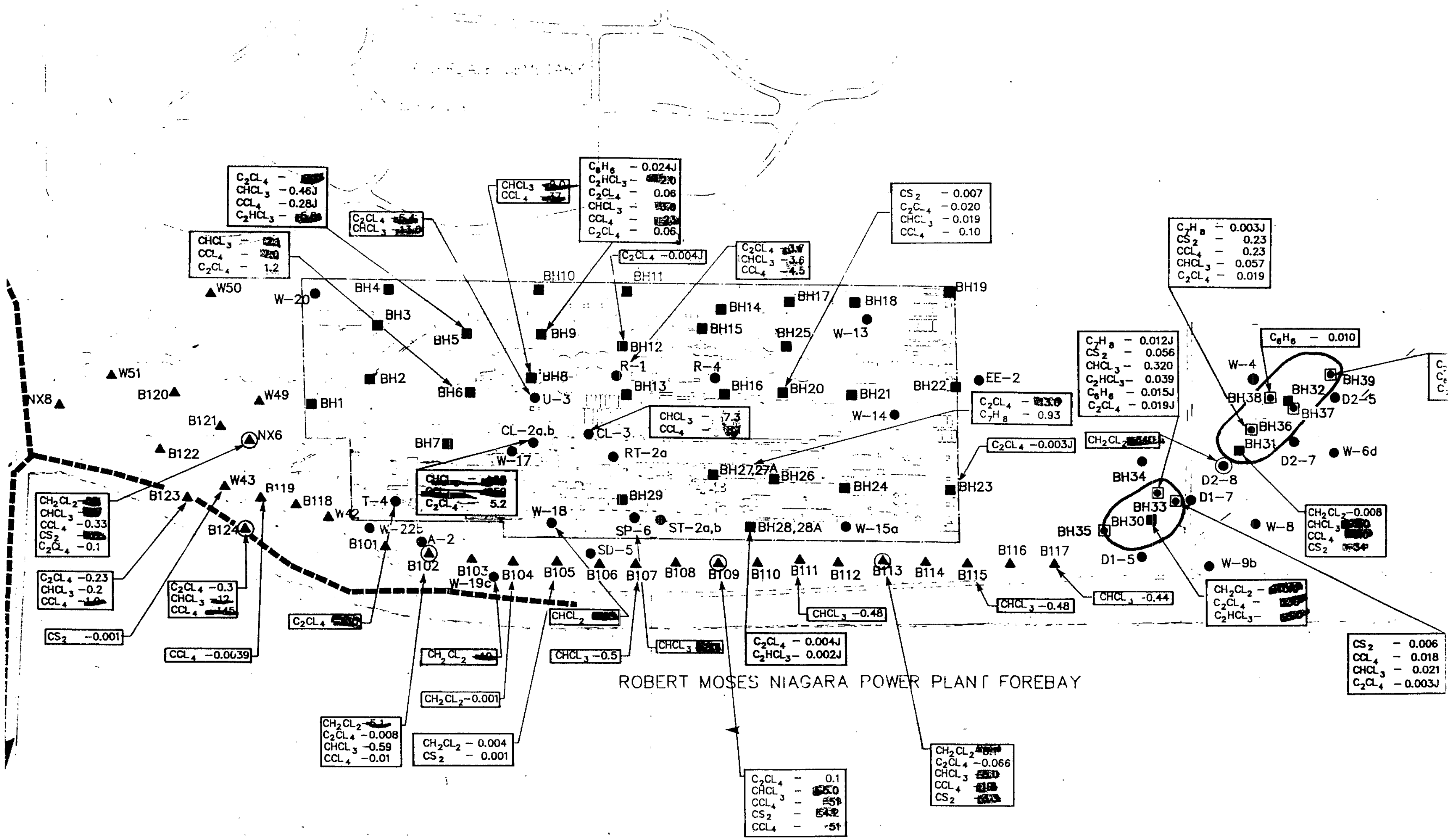
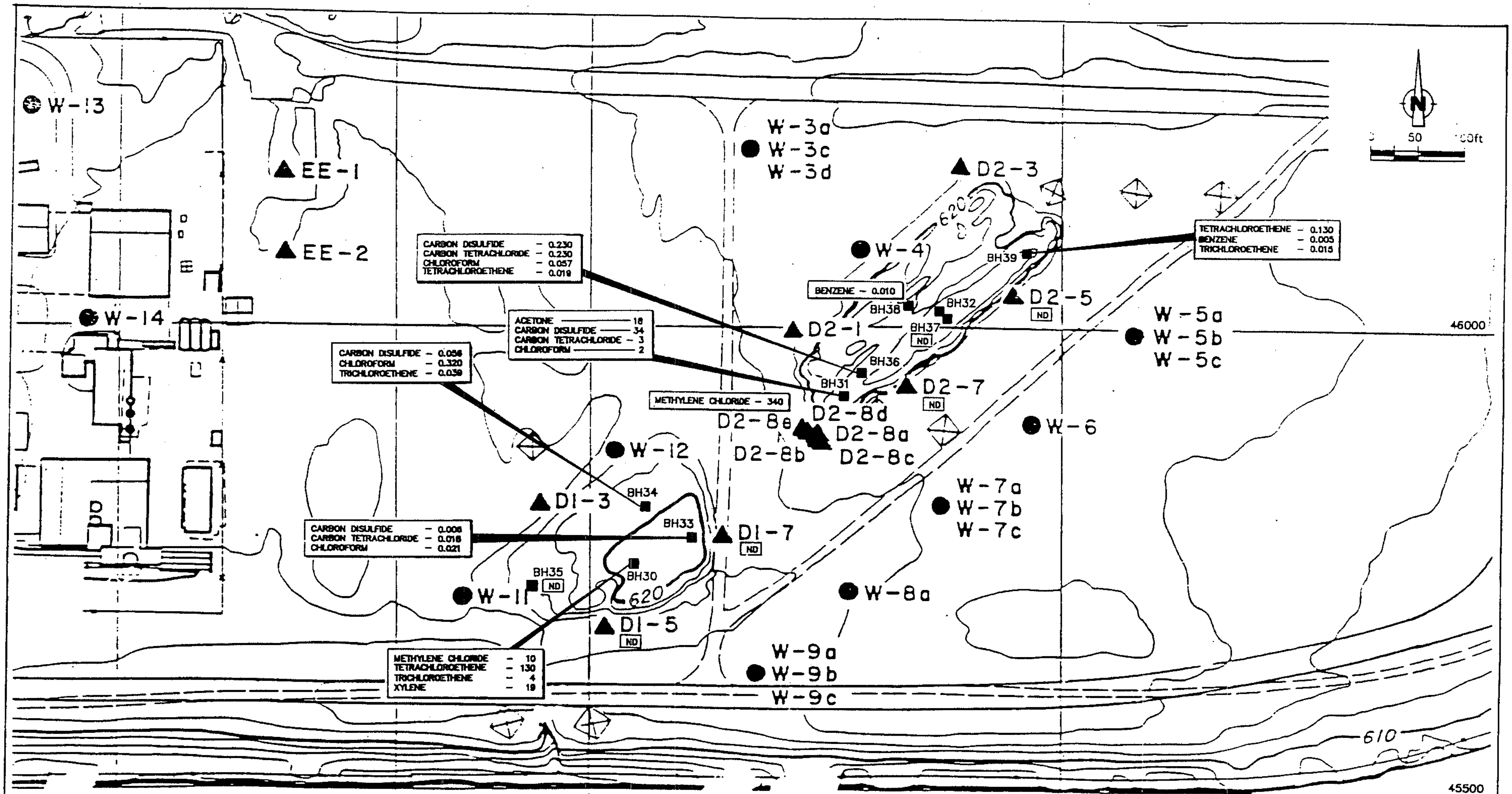


Figure 6 LOCATION PLAN-MONITORING WELL



■ — 1991 SOIL BORINGS PLANT SITE

FIGURE 7



LEGEND

W-8a ● EXISTING MONITORING WELL LOCATION

DI-7 ▲ FORMER BOREHOLE/SOIL SAMPLING LOCATION (BECHTEL 1984)

BH30 ■ CURRENT BOREHOLE/SOIL SAMPLING LOCATION

ND NO PARAMETER DETECTED ABOVE DETECTION LIMIT

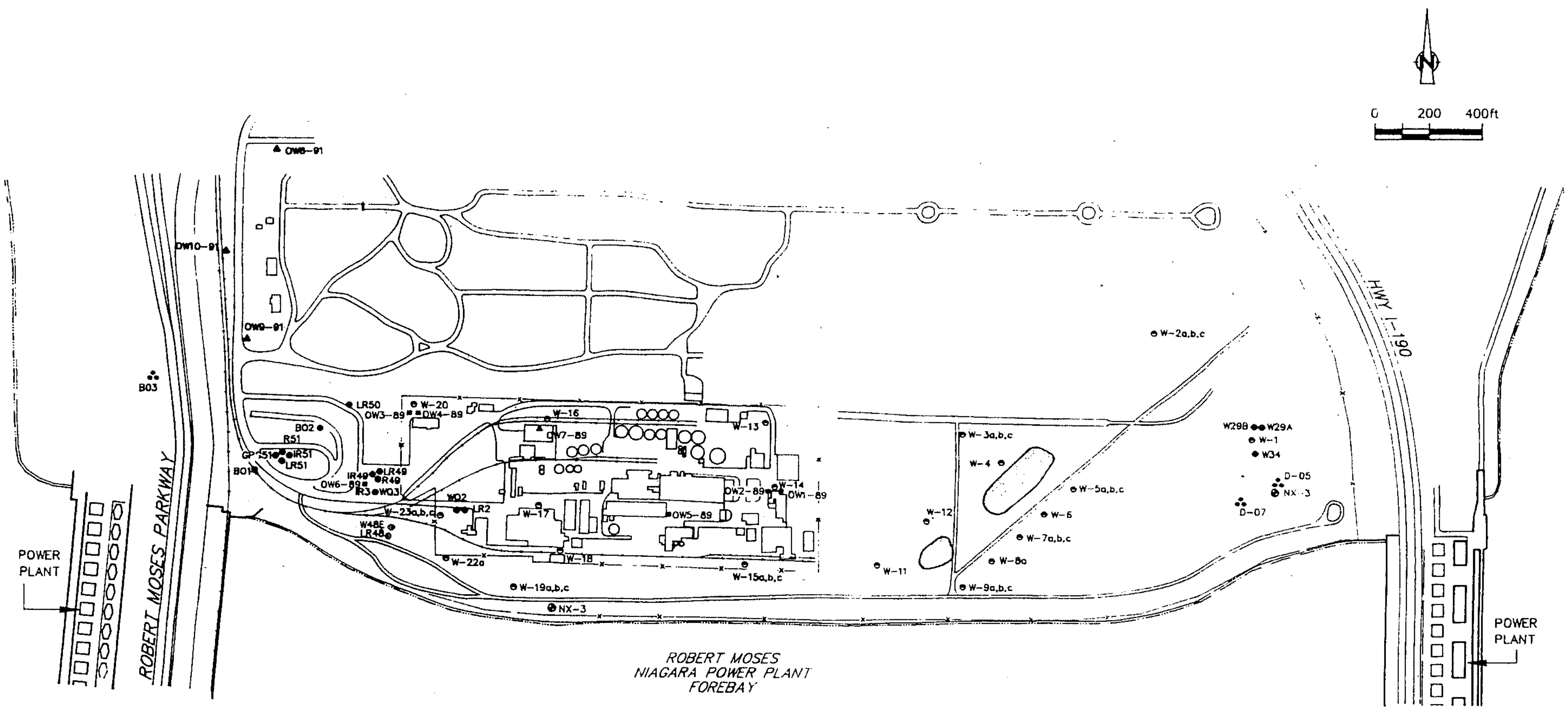
NOTE:
CONCENTRATIONS ARE IN ppm
(milligram/kilogram of soil)

figure 8

VOC CONCENTRATIONS IN SOIL SAMPLES – FORMER LANDFILLS

Stauffer Management Co.

2365-12/04/91-8-1



LEGEND

EXISTING WELLS

● LR48	MONITORING WELLS, 1985-1986	FORMER LANDFILL
⊖ W-22a	MONITORING WELLS, 1983	
∴ B03	PIEZOMETER INSTALLED BY PBQ & D.	
▪	BEDROCK MONITORING WELLS, 1989	
⊗ NX-3	BORINGS PREVIOUSLY DRILLED (CASED TO ROCK, OPEN HOLE IN LOCKPORT FORMATION)	
▲	OVERBURDEN MONITORING WELLS, 1989, 1991	

figure 9

MONITORING WELL LOCATIONS

Stauffer Management Co.

2365-20/04/90-8-0

SMC-789 0931

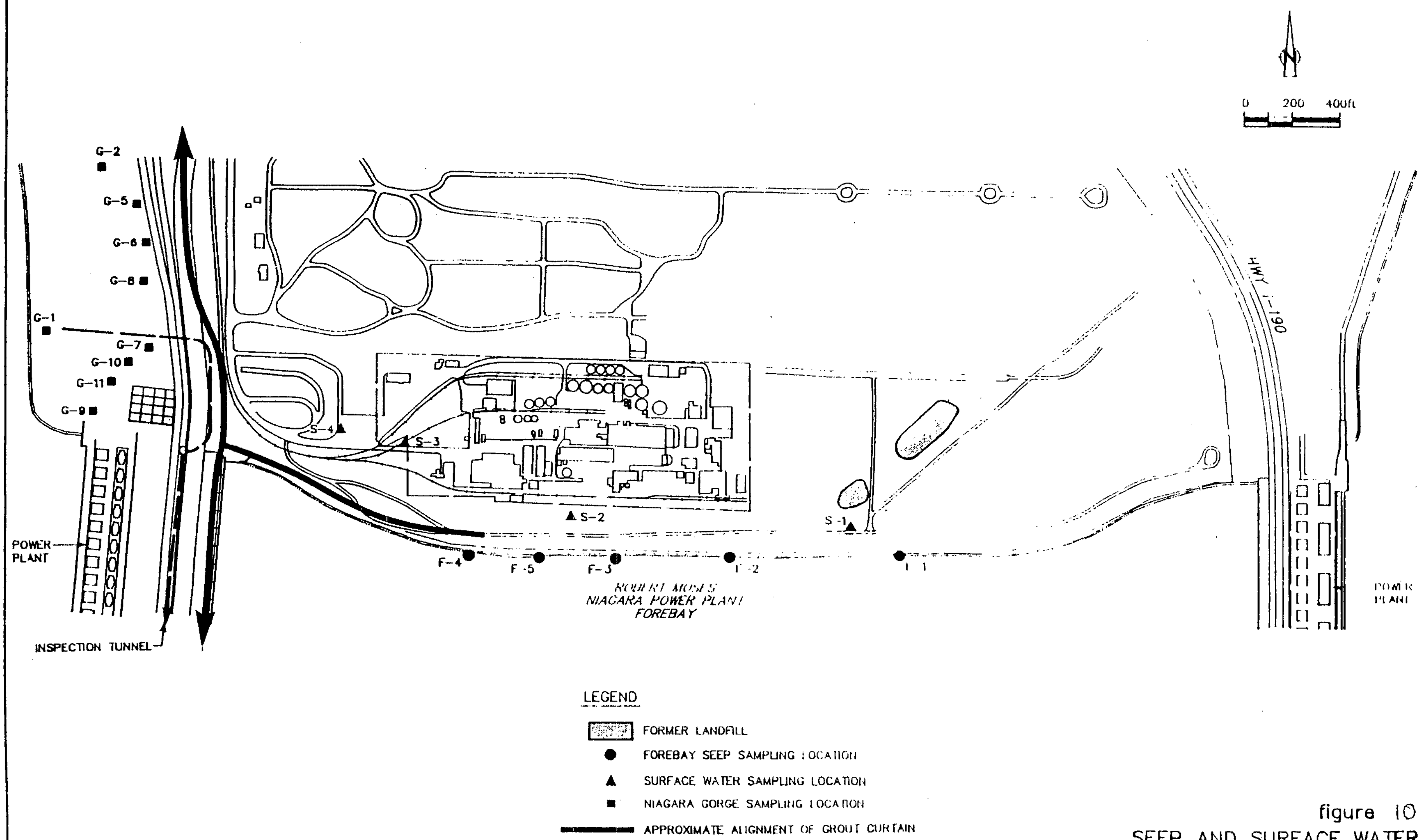


figure 10
SEEP AND SURFACE WATER SAMPLING LOCATIONS
Stauffer Management Co.

2365-20/04/90-8-0

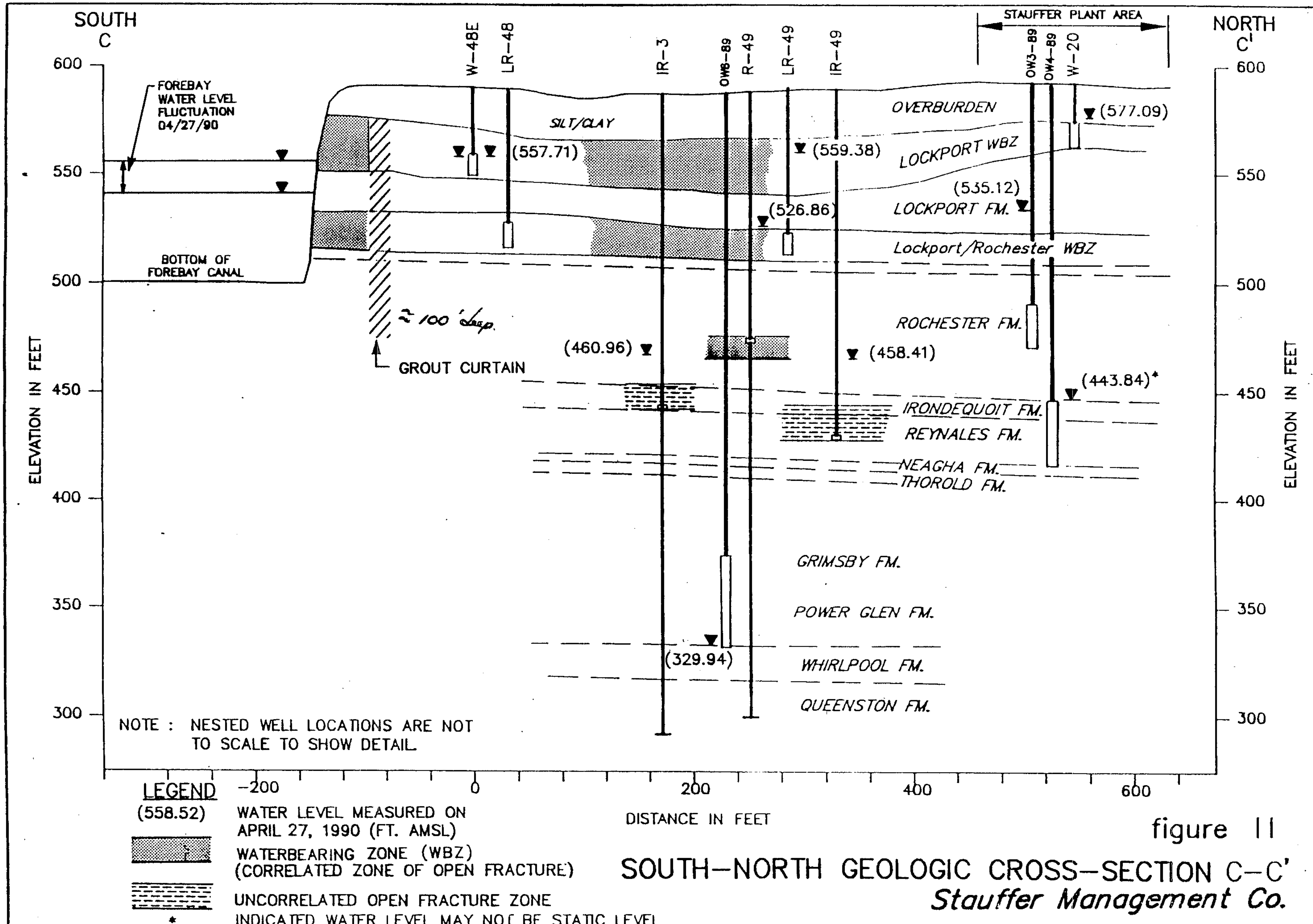


figure 11

SOUTH–NORTH GEOLOGIC CROSS–SECTION C–C'

Stauffer Management Co.

2365-20/04/90-8-0

SYSTEM		GROUP	FORMATION	MEMBER	THICKNESS (feet)	DOMINANT LITHOLOGY	DESCRIPTION
SILURIAN	*UPPER*	SALINA	Bertie		45	Dolostone	massive to laminated, finegrained, dark to light gray, fossiliferous
			Camillus		80 - 100	Shale	green unfossiliferous, occ. dolomite, anhydrite, siltstone
			Syracuse		100	Shale & Dolostone	gray, fossiliferous, occ. dolomite, anhydrite, halite
			Vernon		200	Shale	massive, poorly stratified, green, occ. dolomite, halite
	MIDDLE	LOCKPORT	Oak Orchard/ Guelph		120 - 140	Dolostone	med. to thick-bedded, med. grained, brownish to dark gray, bituminous, occ. cherty, stromatolitic
			Eramosa		7 - 34	Dolostone	v. fine grained, crystalline, gray to brownish gray, occ. chert nodules, shale partings
			Goat Island		16 - 52	Dolostone	massive, fine grained, crystalline, light to dark gray, chert beds, shale bed at upper contact
			Gasport		15 - 45	Limestone & Dolostone	fine to med. grained, semicrystalline, crinoidal, light to med. gray, vuggy
		CLINTON	Decew		5 - 13	Dolostone	fine grained, crystalline, argillaceous, med. to dark gray, shaly partings
			Rochester		55 - 60	Shale & Limestone	thin-bedded, dark gray, calcareous shale, numerous gray limestone interbeds
			Irondequoite		6 - 12	Limestone	med. bedded, fine to med. grained, light to med. gray, crystalline, fossiliferous
			Reynales	Rockway	10	Dolostone	weakly laminated, finegrained, buff to gray, lithographic, occ. shale partings
				Merltton	0 - 3	Limestone	medium grained, crystalline, buff to gray, may be absent
				Hickory Corners	0 - 5	Limestone	thin-bedded, coarse to med. grained, crystalline, dark gray, bioclastic, argillaceous
			Neahga		5	Shale	platy to fissile, soft, dark greenish gray, minor gray limestone
			Thorold		2 - 9	Sandstone	fine to v. fine grained, hard, quartz rich, light gray, silica cement
	LOWER	MEDINA	Grimsby		42 - 55	Sandstone & Shale	fine grained, red (hematitic) sandstone with shale interbeds grading downwards to dominant shale with sandstone interbeds
			Power Glen		34 - 48	Shale & Siltstone	laminated, fissile, sandy calcareous shale, with fine grained sandstone interbeds
			Whirlpool		15 - 28	Sandstone	fine to med. grained, hard, cross bedded, gray to white, thin shaly partings, silica cement
ORDOVICIAN	*UPPER*		Queenston		700 - 1200	Mudstone & Shale	med. bedded, low fissility, random partings, hematitic, uniform, laterally extensive, reddish brown, locally grayish green (reduced by groundwater), extensively fractured and jointed.

SOURCES: Fisher (1970)
Fisher (1977)
Johnson (1964)
Kilgour (1966)
Liberty (1971)
Richard (1966, 1975)
Zenger (1975)

〰〰〰 Represents erosional unconformity

NOTE: Thickness represents measured thicknessess in Niagara Area.
Thickness is entire unit stratigraphic thickness since not exposed at Niagara Falls

figure 12

STRATIGRAPHIC SUCCESSION IN NIAGARA FALLS VICINITY

Stauffer Management Co.

2365-20/04/90-8-0

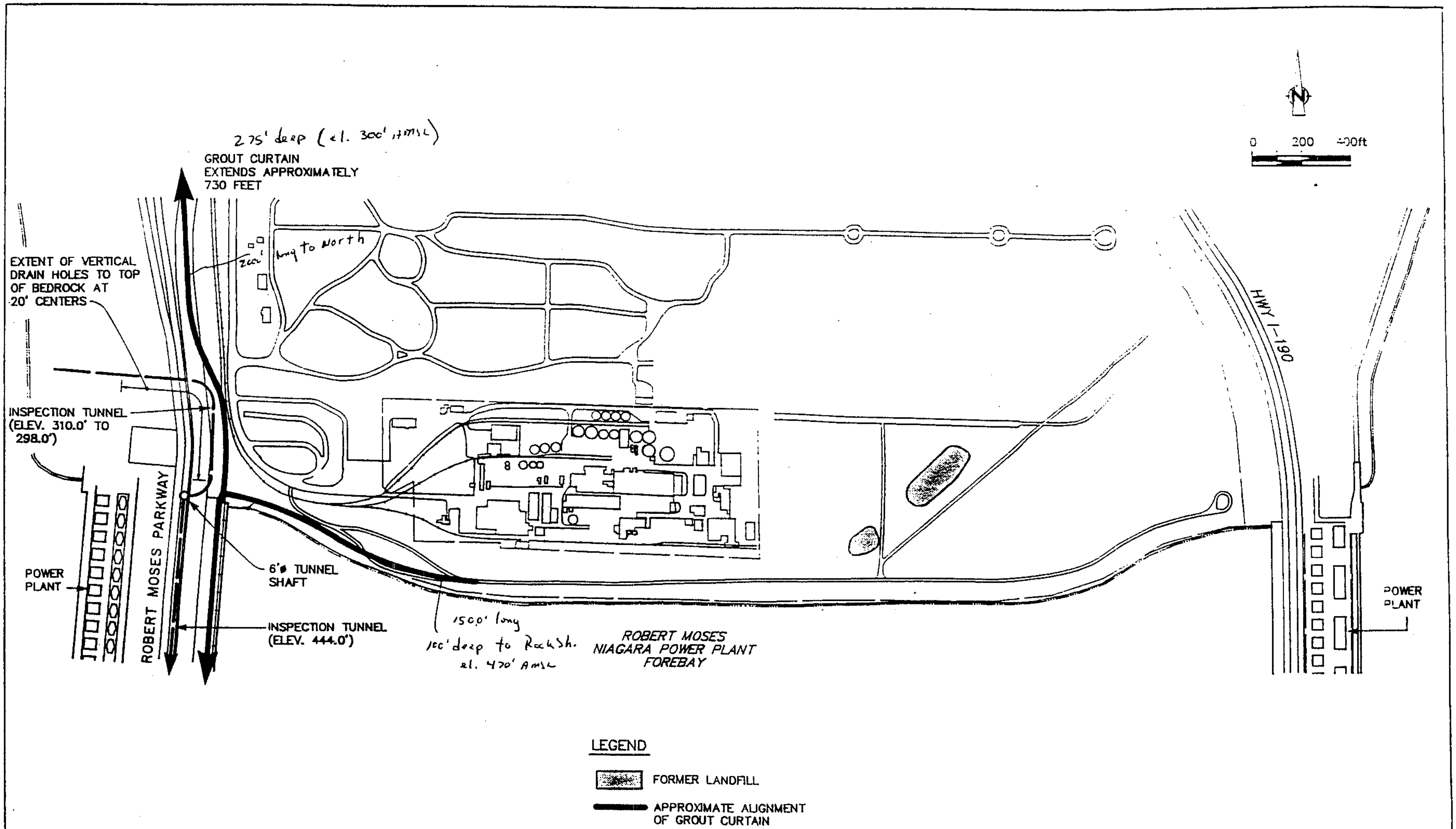
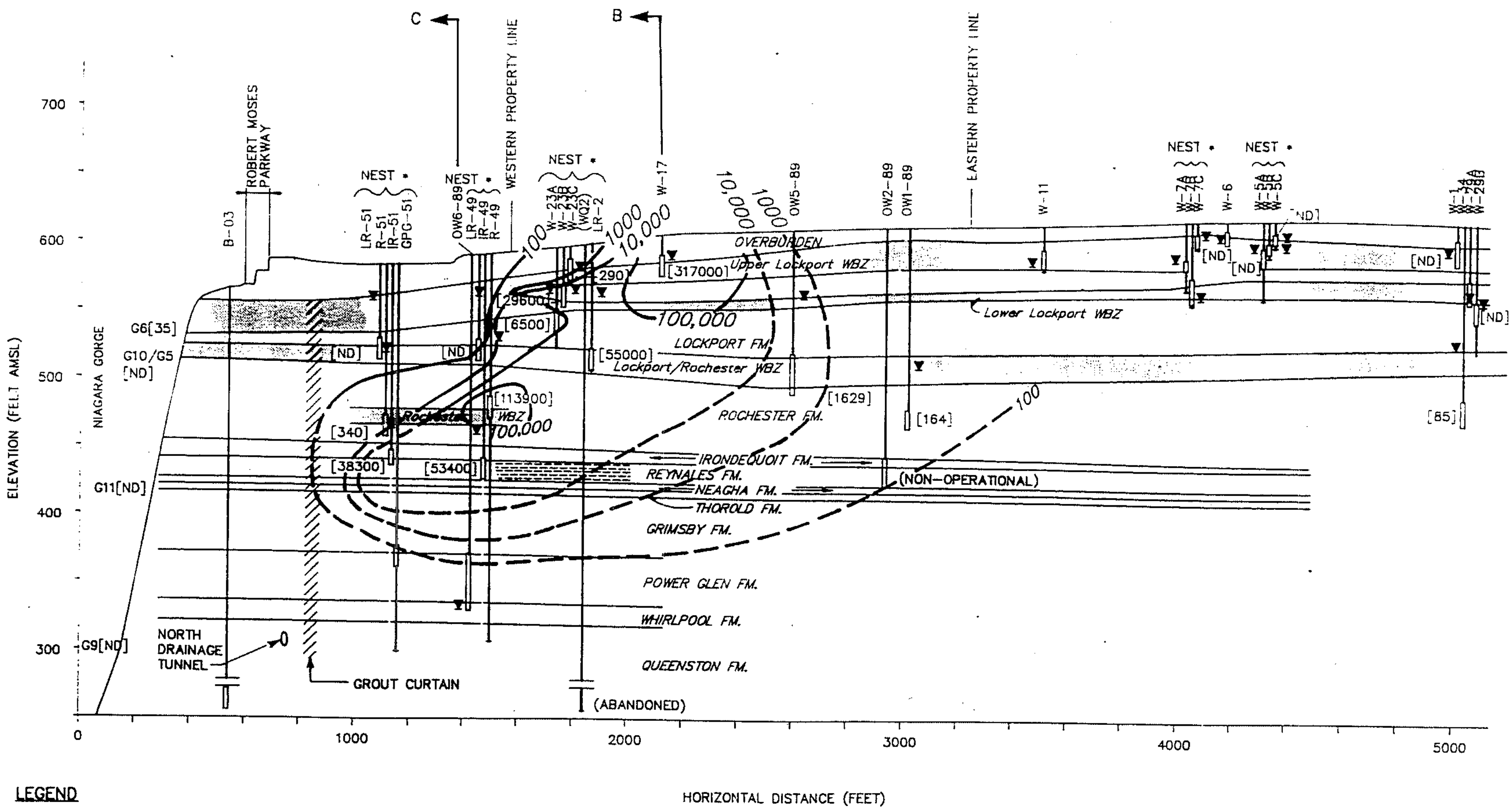


figure 13

GROUT CURTAIN AND NYPA INSPECTION TUNNELS

Stauffer Management Co.



LEGEND

WATERBEARING ZONE (WBZ) (CORRELATED ZONE OF OPEN FRACTURE)

UNCORRELATED OPEN FRACTURE ZONE

[113900] TOTAL VOLATILE ORGANIC CONCENTRATION (ppb), 1989–1990

[ND] NOT DETECTED ABOVE DETECTION LIMIT

1000 ESTIMATED TOTAL VOLATILE ORGANIC ISOPLETH (DASHED WHERE INTERPOLATED)

NOTES:

- NESTED WELLS – LOCATIONS ARE NOT TO SCALE TO SHOW DETAIL

figure 14

TOTAL VOLATILE ORGANIC ISOPLETHS SECTION A–A'

Stauffer Management Co.

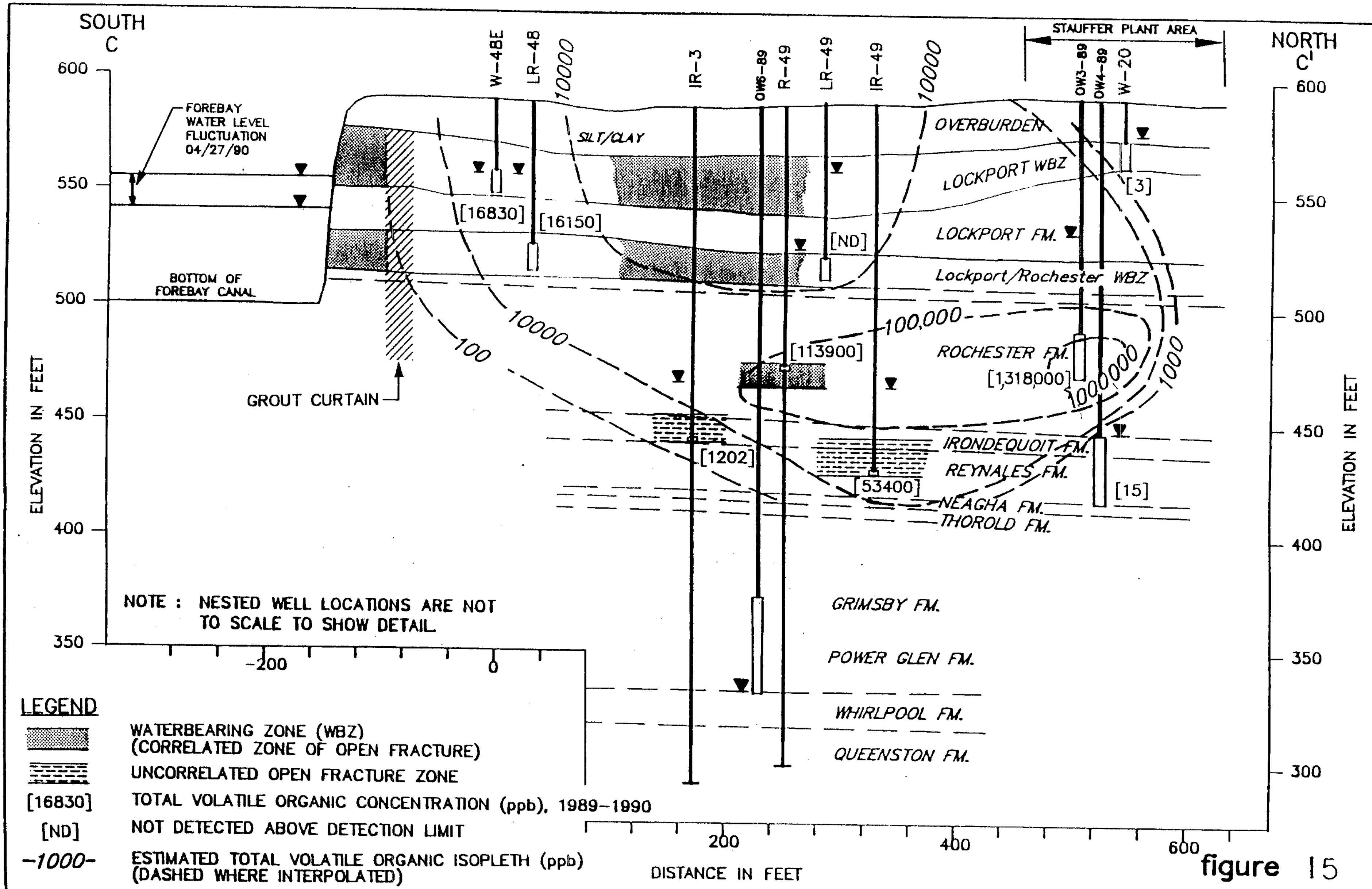
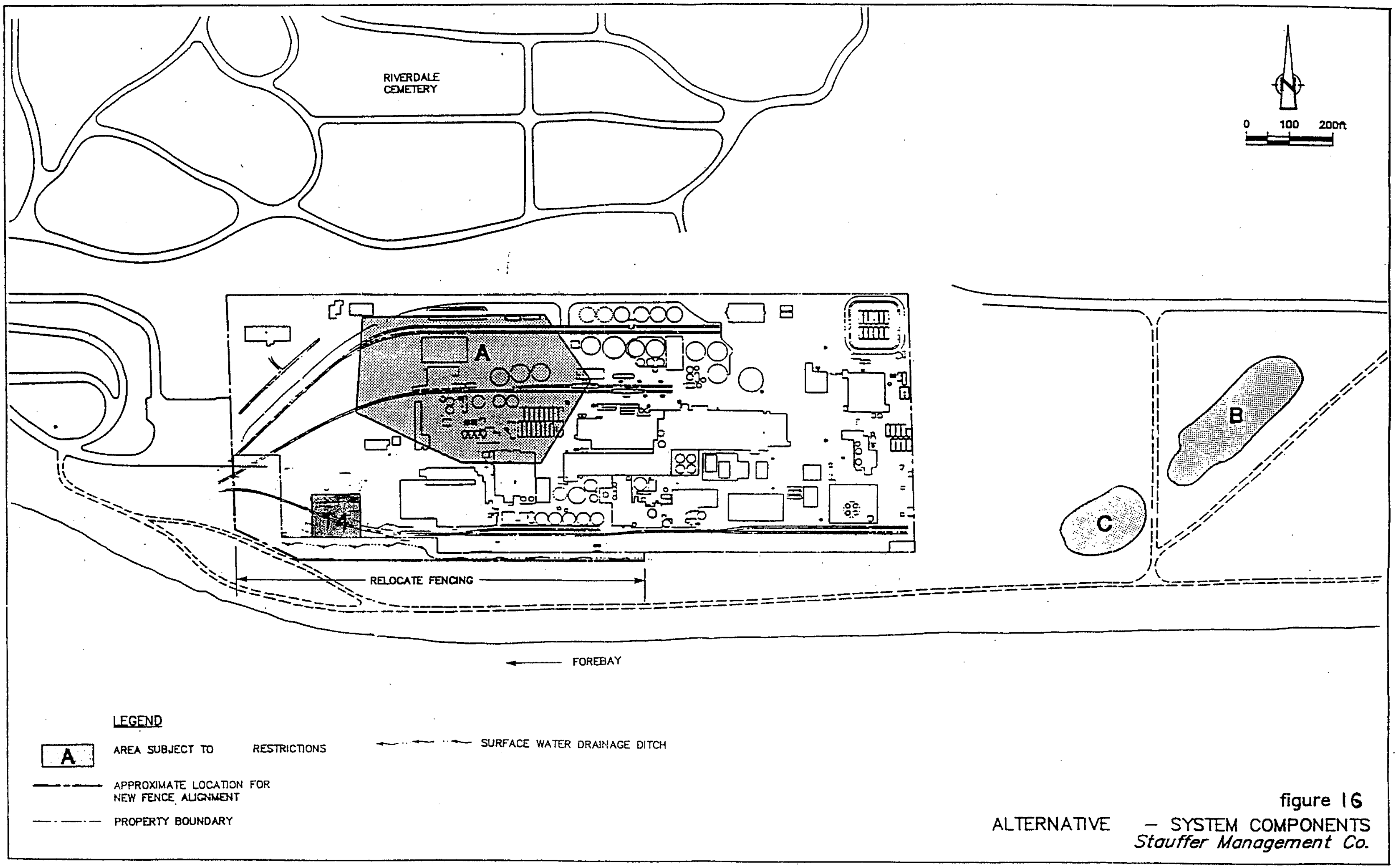


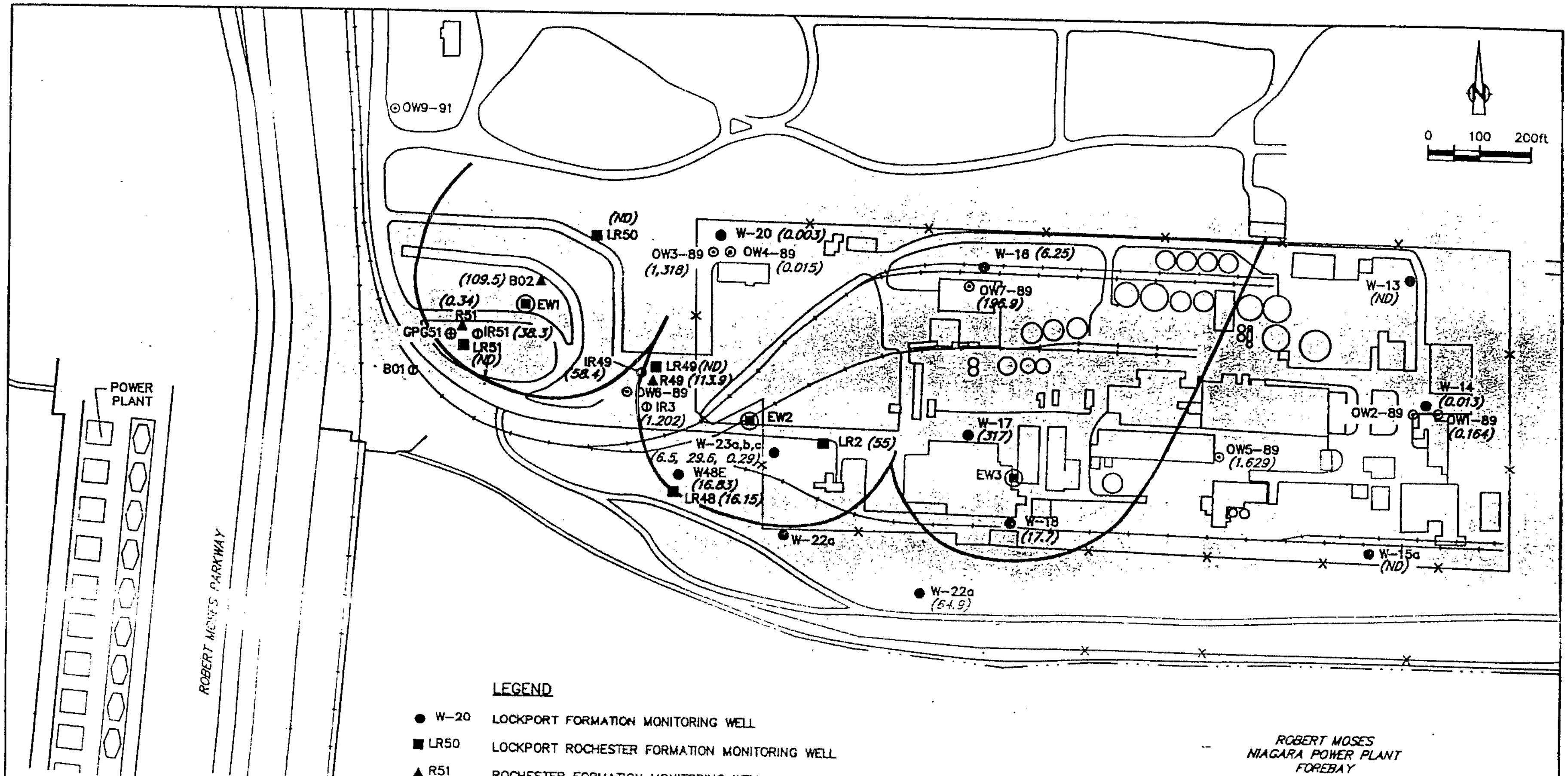
figure 15

TOTAL VOLATILE ORGANIC ISOPLETHS
SECTION C–C'
Stauffer Management Co.

SMC-789 0937



2365-03/07/91-11-0



LEGEND

W-20	LOCKPORT FORMATION MONITORING WELL
LR50	LOCKPORT ROCHESTER FORMATION MONITORING WELL
R51	ROCHESTER FORMATION MONITORING WELL
IR51	IRONDEQUOIT/REYNALES FORMATION MONITORING WELL
GPG51	GRIMSBY/POWER GLEN FORMATION MONITORING WELL
OW3-89	LOCATION OF MONITORING WELL, 1989, 1991
EW2	PROPOSED EXTRACTION WELL
(ND)	NOT DETECTED ABOVE DETECTION LIMIT
(109.5)	TOTAL VOLATILE ORGANICS CONCENTRATION (ppm)
———	ZONE OF CAPTURE

NOTE: WELL DESIGNATIONS IN RED ARE WITHIN THE CAPTURE ZONE

CRA

2365(13)-FEB.13/92-REV.0 (P-27)

figure 17

ZONE OF CAPTURE FOR EXTRACTION WELLS EW1, EW2 AND EW3

Stauffer Management Co.